

Grand Valley Power 2014 Edition



COLORADO RURAL ELECTRIC ASSOCIATION

Statewide Safety Manual 15.1

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Safety Manual Receipt

I, _____, acknowledge receipt of this copy of the

(Print Name)

Grand Valley Power Safety Manual. I understand that it is my obligation to read, study, and follow these safety rules and work procedures and other employer policies and procedures as they apply to the duties that I shall perform for Grand Valley Power. I understand the importance of the Safety Manual, which has been provided to ensure the safety of all fellow employees of Grand Valley Power.

Signature of Employee

Date

Department

Supervisor

FOREWORD

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

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

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

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DEFINITIONS

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

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

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

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

ANSI: American National Standards Institute.

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

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

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

Automated External Defibrillator (AED): A device that automatically analyzes the heart rhythm and, if it detects a problem that may respond to an electrical shock, that permits a shock to be delivered to restore a normal heart rhythm.

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

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

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

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

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

Body Belt (Safety Belt): A strap 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 employee 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: The electrical interconnection of conductive parts designed to maintain a common electrical potential.

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

Bushing: An insulating structure, including a through conductor or providing a passageway for such a conductor, with provision for mounting on a barrier, conducting or otherwise, for the purposes of insulating the conductor from the barrier and conducting current from one side of the barrier to the other.

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

Cable Sheath: A conductive protective covering applied to cables (may consist of multiple layers, one or more of which is conductive).

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

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

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.

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

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

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

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

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

Confined Space: A space that is large enough and so configured that an employee can bodily enter and perform assigned work; has limited or restricted means for entry or exit (some examples are tanks, vessels, silos, storage bins, hoppers, vaults, pits, penstocks, and dike areas); is not designed for continuous employee occupancy; and has one or more of the following characteristics: contains or has a known potential to contain a hazardous atmosphere, contains a material with the potential for engulfment of an entrant, has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section, or contains any other recognized serious safety or health hazard. (Also see Enclosed Space.)

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

Control Authority/System Operator/Dispatch/Power Dispatcher: A qualified person designated by GVP as having authority and responsibility for switching and clearances on lines, cables, stations, and equipment of 600V or above.

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.

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

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: A separated or broken connection from any energy source.

Dispatch: See Control Authority.

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

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

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

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

Electric REC: An organization responsible for the installation, operation, or maintenance of an electric supply system. Also referred to as Rural Electric Cooperative (REC).

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

Employee: In the broad sense, any person employed by or representing GVP.

Employer: Grand Valley Power.

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

Enclosed Space: A working space, such as a tank, vessel, silo, storage bin, hopper, vault, pit, penstock, dike area, manhole, vault, tunnel, or shaft that has a limited means of egress or entry,

that is designed for periodic employee entry under normal operating conditions, and that under normal conditions does not contain a hazardous atmosphere but may contain a hazardous atmosphere under abnormal conditions. (Also see Confined Space.)

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

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

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

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

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

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

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

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

Fall Arrest System: 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.

- **Personal Fall Arrest System:** A system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, or body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these. As of January 1, 1998, the use of a body belt for fall arrest is prohibited.
- **Fall Protection Program:** A program intended to protect workers from injury due to falls when working at elevations.

- **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.
- **Fall Protection System (Hardware):** 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.
- **Fall Restraint System:** A system intended to prevent a worker from reaching the fall hazard through a restraint system. Such systems include a harness and lanyard tied off at a set length to an approved anchorage point.

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

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

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

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

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

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

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

Ground:

- (noun) The connection, established either intentionally or accidentally, of an electric circuit or equipment with reference ground through a conductor, or other conducting object or substance.
- (reference) That conductive body, usually earth, to which an electric potential is referenced.

- (verb) Connecting or establishing a connection, either intentionally or accidentally, of an electric circuit or equipment to reference ground. Connect to earth or some conducting body that serves in place of earth.

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

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

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

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

Hazardous 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 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.

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

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

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

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

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

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

Immediately Dangerous to Life or Health (IDLH): Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.

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

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

Job Briefing: A meeting in which the employee in charge is required to discuss, at a minimum, the following subjects: hazards associated with the job, work procedures involved, special precautions, energy source controls, and personal protective equipment (PPE) requirements. Refer to Section 115.5, Job Briefings.

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

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

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

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

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

Live-Line Tools and Ropes: Those tools and ropes that are specially designed for work on energized lines and equipment operating at 600 volts and greater. Insulated aerial equipment specially designed for work on energized lines and equipment shall be considered “live-line.”

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

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

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.

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

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

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

Maximum Permissible Exposure (MPE) Limits: The maximum electric and magnetic field strengths or their plane wave equivalent power densities to which a person may be exposed without harmful effect and with an acceptable safety factor as determined by the Federal Communication Commission’s latest regulation.

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

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

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

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

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

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

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

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

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

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

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.

Power Dispatcher: See Control Authority.

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

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

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

Public: Any individual not an employee or representative of GVP.

Qualified Person (for Electric Power Generation, Transmission and Distribution):

One knowledgeable in the construction and operation of the electric power generation, transmission, and distribution equipment involved, along with the associated hazards. Qualified employees shall be trained and competent in:

- (1) the skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment;
- (2) the skills and techniques necessary to determine the nominal voltage of exposed live parts;
- (3) the minimum approach distances corresponding to the voltages to which the qualified employee will be exposed; and
- (4) the proper use of precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electric equipment. An employee who is undergoing on-the-job training and who, in the course of that training, has demonstrated an ability to perform duties safely at his level of training and who is under the direct supervision of a qualified employee is considered to be a qualified employee for the performance of those duties. An employee undergoing on-the-job training must meet the full requirements for fall protection.

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

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

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

Registered Professional Engineer: A person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer registered in any state is deemed to be a “registered professional engineer” within the meaning of this standard when approving designs for “manufactured protective systems” or “tabulated data” to be used in interstate commerce.

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

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

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

Rural Electric Cooperative: The employer. The entity that has jurisdiction and control over the operation of the utility.

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

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

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

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

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

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

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

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

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

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

Spike: A tool used to ensure underground electric power cables are de-energized. Also can refer to the process of ensuring that underground electric power cables are de-energized.

Stable Rock: Natural solid mineral material that can be excavated with vertical sides and which will remain intact while exposed. Unstable rock is considered to be stable when the rock material

on the side or sides of the excavation is secured against caving in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.

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

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

Supervisor: See Foreman.

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

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

System Operator: See Control Authority.

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,” “tool box talks,” or “5 minute safety talks.” Refer also to Section 115.5, Job Briefings.

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

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

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.

Voltage: The effective (root mean square [RMS]) potential difference between any two conductors or between a conductor and ground. The voltage specified in this *Manual* shall mean the effective voltage to which the personnel or protective equipment may be subjected. Secondary voltage includes voltages up to 600 volts. Primary voltage shall mean voltages in excess of 600 volts.

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

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

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

Wireless 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.

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

INTRODUCTION

Accident Prevention

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

Purpose

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

Effectiveness

This *Manual* shall be effective as of the date of publication; compliance by every employee is mandatory and is considered a requirement for employment upon receipt.

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

Emergency Conditions

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

Occupational Safety and Health Requirements

Grand Valley Power is responsible to have its employees comply with all aspects of Occupational Safety and Health Act (OSHA) rules (or as modified by the state) and may be subject to severe penalties for violation of these requirements by any employee. As stated in OSHA, "Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to their own actions and conduct."

Those employees who do not abide by the safety rules of this *Manual* or other GVP safety requirements may be subject to disciplinary action, which may include dismissal, as determined by the severity of the situation.

Supervisor Responsibilities

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

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

Responsibility of Employees

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

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

Knowledge of Safety Rules

Every employee shall become thoroughly familiar with the contents of this *Manual* as they apply to their work activities. The point here is to understand the manual not just read it.

Conditions Not Covered

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

Qualifications for Duty

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

Care in Performance of Duties

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

Resources

The contents of this *Safety Manual* were developed from various sources, which included the OSHA of 1970, the National Electrical Safety Code (NESC), American Society for Testing and Materials (ASTM), and National Fire Protection Association (NFPA NEC70E 2011 ed.), among others.

To assist the user of the *Manual* in obtaining additional information concerning a specific section, a reference to the applicable standard (NESC rule, ASTM reference, NFPA standard, and/or OSHA) has been included in the respective section. Sections without reference numbers fall under the Act's "General Duty Clause," which states that employees shall be provided a workplace free of recognized hazards.

Gender Wording

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

PART 1 GENERAL RULES

PART 1 GENERAL RULES

101 Application

- a) Every employee shall carefully study (not merely read) those safety rules applicable to their assigned duties. Compliance with these safety rules is mandatory and is considered a requirement for employment.
- b) If an employee is called upon to perform work that could be considered hazardous and proper protection is not provided, the matter should be brought to the attention of their supervisor before starting the work. If questions arise, final interpretation rests with the supervisor.
- c) These rules represent minimum requirements and are only intended to cover average conditions. Employees shall use good judgment in dealing with conditions not covered in these rules. Additionally, employees shall follow all GVP policies and procedures.

102 Employees' Responsibility for Safety

- a) Before beginning a job, employees shall satisfy themselves that they can perform the task without injury. If they are in doubt as to their ability to perform the work, they shall call this to the attention of their supervisor.
- b) Before starting a job, employees shall thoroughly understand the work to be done, their part in the work, and the safety rules that apply.

103 Reporting Employee Injuries

- a) Injuries, no matter how slight, shall be reported to the person in charge as soon as practical.
- b) All minor injuries shall be properly treated and reported to the employee's supervisor.
- c) When professional medical services are necessary, a physician designated by GVP should be used whenever possible. Such injuries shall be reported to management immediately.
- d) In case of a fatal accidents to employees, appropriate action shall be taken promptly. The accident shall be reported immediately to the department head or manager and OSHA.
- e) Near misses as well as actual injuries shall be reported.
- f) Employees shall refer to GVP policies for additional requirements.

104 Reporting Hazardous Conditions

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

105 Taking Chances

- a) Before commencing any work that may be hazardous, care shall be taken to establish a safe procedure. When more than one employee is engaged in the same job, all employees concerned shall understand the procedures to be followed (refer to Section 115.5, Job Briefings). Under no circumstances shall safety be sacrificed for speed.
- b) Employees shall always try to place themselves in a safe and secure position.

106 Practical Jokes

Employees shall not engage in practical jokes “horseplay” or boisterous conduct while on the job..”

107 Guards

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

108 Warnings

- a) Warning signs shall be heeded. Persons seen in a dangerous situation shall be warned without being startled. Employees not required to be near potentially dangerous places shall keep away from them.
- b) For additional information concerning warning signs, refer to OSHA Standard 29 CFR 1910.145.

109 Intoxicating Beverages and Drugs

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

No employee shall report to work, or be at work, with detectable amounts of alcohol, drugs, or controlled substances in their body. An employee taking drugs prescribed by a physician, over-the-counter drugs, or herbal drugs that may impair safe performance of their work duties, shall report this fact to their immediate supervisor before starting work.

110 Housekeeping

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

- a) Combustible materials, such as oil soaked rags, waste, and shavings, shall be kept in approved metal containers with metal spring lids. Containers shall be emptied as soon as practicable.
- b) Both clean rags and used rags shall be kept in metal or metal-lined bins having metal covers, with a spring lid.
- c) Flammable liquids shall be used only for their designed purposes. Gasoline, benzene, naphtha, lacquer thinner, etc., shall not be used for cleaning purposes or for starting or kindling fires.
- d) Permanent floors and platforms shall be kept free of dangerous projections or obstructions and shall be maintained reasonably free from oil, grease, or water. Where the type of operation produces slippery conditions, mats, grates, cleats, or other methods shall be used to reduce the hazard of slipping.

- e) Stairways, aisles, permanent roadways, walkways, and material storage areas in yards shall be kept reasonably clear and free from obstructions, depressions, and debris.
- f) Materials and supplies shall be stored in an orderly manner to prevent their falling or spreading and to eliminate tripping and stumbling hazards.
- g) No clothing shall be allowed to hang on walls, behind doors, or in the space back of switchboards. No matches shall be left in clothes placed in lockers. Rubbish and unused clothing shall not be allowed to accumulate in lockers.
- h) Paper and other combustible materials shall not be allowed to accumulate, and weeds or other range vegetation shall not be permitted to grow in or around substations, pole yards, buildings, oil tanks, or other structures.
- i) Underwriters Laboratories (UL)-approved, properly labeled safety cans shall be used for the handling and use of flammable liquids such as gasoline, naphtha, and lacquer thinner in quantities greater than 1 gallon. For quantities of 1 gallon or less, only the original container or UL-approved and properly labeled safety can shall be used. All solvents should be kept in approved, properly labeled containers. Gasoline, naphtha, lacquer thinner, and other solvents of this class shall be handled and dispensed only in UL-approved, properly labeled (yellow letters), red metal safety cans.
- j) Section 110 i) above does not apply to kerosene and cleaning agents of the “Stoddard” solvent class; however, not more than 1 gallon of such liquids shall be kept in any open container. The container shall be provided with a proper cover and be kept securely covered except when in actual use.
- k) In any building, except one provided for its storage, no more than 25 gallons of flammable or combustible liquids shall be stored in a room outside of an approved storage cabinet. A “maximum capacity” of not more than 60 gallons of Class I or Class II liquids, no more than 120 gallons of Class III liquids, may be stored in a storage cabinet. No more than three such cabinets may be located in a single storage area. Quantities in excess of these amounts shall be stored in an inside storage room designed for storage of flammable and combustible liquids.
- l) When employees pour or pump gasoline or other flammable liquids from one container to another, bonding shall be maintained between the pouring and receiving containers. Transferring of flammable liquids from one container to another shall be accomplished only in properly ventilated spaces free from ignition sources.
- m) Flammable or combustible liquids shall not be stored in areas used for exits or stairways or areas normally used for the safe passage of people.
- n) Strict adherence shall be paid to “No Smoking” and “Stop Your Motor” signs at fuel dispensing locations.
- o) For additional information concerning housekeeping and flammable and combustible liquids requirements, refer to OSHA Standards 29 CFR 1910.141 and 29 CFR 1910.106.

111 Smoking

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

Colorado Clean Indoor Air Act

The General Assembly of the State of Colorado has enacted, within its Colorado Revised Statutes, the “Colorado Clean Indoor Air Act. Concerning enactment of, and, in connection therewith, prohibits smoking in indoor enclosed areas, including places of employment.

For a complete description of the act open:

http://www.state.co.us/gov_dir/leg_dir/olls/sl2006a/sl_22.htm

Colorado Red Flag Warning and Burn Bans

In Colorado, a red flag warning is a warning issued by the National Weather Service to inform Colorado fire-fighters and the general public that forecast conditions indicates a high risk of grassland and forest fire ignition.

112 Welding and Cutting--General

- a) Welding and cutting shall be performed only by experienced and properly trained persons. Before welding or cutting is started, the area shall be inspected for potential fire hazards and a hot work permit will be obtained if required by company policy.
- b) When welding or cutting in elevated positions, precautions shall be taken to prevent sparks or hot metal from falling onto people or flammable material below.
- c) Suitable fire extinguishing equipment shall be immediately available at all locations where welding and cutting equipment is used.
- d) Matches and compressed gas lighters shall not be carried by welders or their helpers when engaged in welding or cutting operations.
- e) A fire watch shall be maintained wherever welding or cutting is performed in locations where combustible materials present a fire hazard. A fire check shall be made of the area 1/2 hour after completion of welding.
- f) Where combustible materials such as paper clippings or wood shavings are present, the floor shall be swept clean for a radius of 35 feet before welding. Combustible floors shall be kept wet or be protected by fire-resistant shields. Where floors have been wetted down, personnel operating arc welding or cutting equipment shall be protected from possible shock.
- g) To protect eyes, face, and body during welding and cutting, the operator shall wear an approved helmet or goggles, proper protective gloves, and clothing.
- h) Proper eye protection shall be worn to guard against flying particles when the helmet or goggles are raised.
- i) A shirt or jacket of the proper protective level, made of nonsynthetic material, with full-length sleeves rolled down and buttoned, shall be worn when performing or while exposed to welding/cutting activities. Refer to Section 406, Clothing, for more information on clothing requirements.
- j) When performing welding activities, the employer shall ensure that each employee removes or renders nonconductive all exposed conductive articles such as key or watch chains, rings, wrist watches or bands, unless such articles do not increase the hazards associated with contact with the energized parts.
- k) Machinery, tanks, equipment, shafts, or pipes that could contain explosive or highly flammable materials shall be thoroughly cleaned and decontaminated prior to the application of heat.
- l) In dusty or gaseous spaces where there is a possibility of an explosion, welding or cutting equipment shall not be used until the space is adequately ventilated.

- m) Welders shall place welding cable, hoses, and other equipment so that they are clear of passageways, ladders, and stairways.
- n) Where the work permits, the welder should be enclosed in an individual booth or shall be enclosed with noncombustible screens.
- o) After welding or cutting operations are completed, the welder shall mark the hot metal or provide other means of warning other workers.
- p) Helpers or attendants shall wear proper eye protection. Other employees shall not observe welding operations unless they use approved eye protection. Similarly, workers or other persons adjacent to welding areas shall be protected from rays by shields or shall be required to wear appropriate eye and face protection.
- q) Potentially hazardous materials in fluxes, coatings, covering, and filler metals are released to the atmosphere during welding or cutting operations. While welding or cutting, adequate ventilation or approved respiratory protection equipment shall be used. Special precautions shall be taken when using materials that contain cadmium, fluorides, mercury, chlorinated hydrocarbons, stainless steel, zinc, galvanized materials, beryllium, and lead. Employees shall refer to GVP's Hazard Communication Program for specific requirements pertaining to the above listed hazardous materials.
- r) Employees welding or cutting in confined spaces shall conform to the requirements of Section 201, Confined or Enclosed Spaces.
- s) Gas welding and cutting: Only approved gas welding or cutting equipment shall be used:
 - (1) Approved backflow check valves shall be used on gas welding rigs in both gas and oxygen lines.
 - (2) Welding hose shall not be repaired with tape.
 - (3) Matches shall not be used to light a torch; a torch shall not be lighted on hot work. A friction lighter or other approved device shall be used.
 - (4) Oxygen or fuel-gas cylinders shall not be taken into confined spaces.
 - (5) Refer to Section 303, Compressed Gases, for additional requirements concerning specific gases, and compressed gas cylinder use, care, and storage requirements.
- t) Electric welding: Only approved electric welding equipment shall be used:
 - (1) The electric welding machine shall be properly grounded before use.
 - (2) Rules and instructions supplied by the manufacturer or affixed to the machine shall be followed.
 - (3) Welders shall not strike arc with an electrode, whenever persons are nearby who might be affected by the arc.
 - (4) When electrode holders are to be left unattended, the electrodes shall be removed and the holders shall be so placed or protected that they cannot make electrical contact with employees or conducting objects.
 - (5) When the welder must leave the work or stop work for any appreciable length of time, or when the welding machine is to be moved, the power supply to the equipment shall be de-energized.
- u) For additional information concerning the requirements for welding and cutting, refer to OSHA Standards 29 CFR 1910.252 and 29 CFR 1910.253.

113 Wireless Electronic Devices

a) Work use of wireless electronic devices, including but not limited to, telephones, laptop computers, tablets, and portable music players, is covered by GVP's own telecommunications

and/or electronics policy. Any use of wireless electronic devices should be in compliance with state and/or federal law(s) such as the FMCSA Mobile Phone Restrictions for CMV Drivers. Employees should not use wireless devices when operating GVP-owned vehicles. Grand Valley Power has its own policy for the use of wireless electronic devices.

b) The following are basic guidelines for the use of wireless electronic devices:

- (1) Wireless electronic devices should not be used while employees are performing the following tasks:
 - Performing live-line work.
 - Working from the bucket of an aerial lift.
 - Climbing or “belted off” on wooden poles or structures.
 - Climbing or working on steel structures of a substation.
 - Any time you are working with a crew or by yourself where the call would create a safety issue or unnecessary work stoppage.
 - While driving or operating any vehicle, unless hands free call/talk system is utilized (in accordance with state and/or federal law).
- (2) Personal use of wireless electronic devices should be limited.
- (3) The volume on wireless devices should be kept at a low level as not to startle other workers performing tasks.
- (4) If a call must be received or made, the worker must ensure that the work area and all personnel in the work area are safe before answering or placing the call.
- (5) Final judgment on use of wireless electronic devices shall be determined by a supervisor or other GVP authority.

114 Cardiopulmonary Resuscitation (CPR), First Aid, and Automated External Defibrillators (AEDs)

114.1 Introduction

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.

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 so as to be better prepared to assist fellow employees in the event of an accident. All employees should have a current first aid and CPR/AED card and be trained according to the latest standards. All employers and employees should adhere to nationally recognized standards, certifications, and training programs. American Red Cross, American Heart Association, National Safety Council (Green Cross), American Safety and Health Institute, and MEDIC First Aid, among others, provide excellent first aid and CPR training resources.

114.2 General - exposure control plan.

a) 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 the GVP exposure control procedures. All blood, body fluids, and used first aid supplies shall be properly cleaned up and disposed of according to federal, state, and local regulations.

b) Employees shall be familiar with the basic techniques for 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 situation is most valuable. All employees should be aware of the medical services available and how to obtain them.

c) Personnel engaged in overhead line work shall know how to perform pole top and bucket rescue. Refer to Section 115.6, Pole Top Rescue, and 115.7, Bucket Truck/Aerial Lift Rescue. Personnel engaged in underground or confined space work should know how to address an emergency in these situations. Refer to Section 201, Confined or Enclosed Spaces. Employees should also be familiar with GVP's emergency procedures.

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

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

f) First Aid, CPR, and Bloodborne Pathogen Kits or Stations are readily available at each work location, meet all the applicable standards, and are adequate to serve the emergency needs anticipated.

Criteria:

- * Kit locations are identified with signs or markings on operation vehicles.

- * Kits or stations have a checklist and corresponding supply of critical items that match the user training levels for handling first aid, CPR, and bloodborne pathogen type emergencies.

- * Interviewed employees are familiar with location of these kits or stations and also familiar with the use of the equipment and supplies.

- * First aid kits and stations also contain the recommended materials necessary to handle bloodborne pathogen and cardio pulmonary resuscitation emergencies.

- * First aid kits and stations are very clean, well organized, and the equipment and supplies are inspected monthly in preparation for emergency use.

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

114.3 Cardiopulmonary Resuscitation (CPR) – General

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.

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. Refer to Section 115.6, Pole Top Rescue, Section 115.7, Bucket Truck/Aerial Lift Rescue, and/or Section 201, Confined or Enclosed Spaces, for more information.

CPR should be given at a rate of 30 compressions to 2 breaths.

- a) Make sure that the scene is safe.
- b) Tap the victim and shout to see if the victim responds. If the victim does not respond, begin CPR.
- c) Call 911 or local emergency number. If an AED is accessible, retrieve it.
- d) Place victim on firm, flat surface to check breathing. If the victim is unresponsive and not breathing or is only gasping, CPR should be administered.
- e) Give 30 compressions at a rate of at least 100 per minute and a depth of at least 2 inches. Allow the chest to rise to normal position after each compression.
- f) Open the airway with a head tilt-chin lift, pinch the nose shut, cover victim's mouth with your mouth using a barrier device, and give 2 breaths of 1 second each. Watch for chest rise when giving each breath.
- g) Continue CPR until relieved, the victim regains consciousness, the scene becomes unsafe, an AED is ready to use, you are too exhausted to continue, or another trained responder arrives and takes over.

Note: The American Heart Association Emergency Cardiovascular Care – ECC – Committee notes that Hands Only (Compression Only) CPR, given by a bystander when a sudden cardiac arrest is witnessed, will give the victim a similar chance for survival as compared to conventional CPR. Victims of drowning, trauma, airway obstruction, acute respiratory disease, and apnea may benefit from additional interventions taught in a conventional CPR course.

114.4 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
 - (5)by trained, professional medical personnel, normally at the hospital. (If the tourniquet is loosened, severe shock can result.)

114.5 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:

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:

 - (1) 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.
 - (2) 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.
 - (3) Continue to monitor the victim's ABCs.
 - (4) Do not give the victim anything to eat or drink, even though he is likely to be thirsty.

114.6 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.

114.7 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. Refer to Section 114.3, Cardiopulmonary Resuscitation (CPR) – General.

115 Training

115.1 Employee Training

- a) Employees shall be trained in and familiar with the safety-related work practices, safety procedures, and other safety requirements in this section that pertain to their respective job assignments.
- b) Employees shall also be trained in and familiar with any other applicable safety practices, including emergency procedures that are not specifically addressed in this section but are related to their work and necessary for their safety.
- c) The degree of training shall be determined by the risk to the employee for the hazard involved.
- d) Employee training is not confined to this section and can be found throughout this Safety Manual in more specific sections.

115.2 Qualified Employee Training

- a) Qualified employees shall be trained and competent in the skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment.
- b) Qualified employees shall be trained and competent in the skills and techniques necessary to determine the nominal voltage of exposed live parts, the recognition of electrical hazards to which the employee may be exposed and the skills and techniques necessary to control or avoid these hazards.
- c) Qualified employees shall be trained and competent in the skills and techniques necessary to determine the minimum approach distances corresponding to the voltages to which they are exposed.
- d) Qualified employees shall be trained and competent in the proper use of the special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment.
- e) Training may be classroom or on-the-job.

- f) Training shall establish employee proficiency in the work practices required.
- g) ***Demonstration of proficiency.***
The employer shall ensure that each employee has demonstrated proficiency in the work practices involved before that employee is considered as having completed the training required by paragraph (b) of this section.
 - 1) They are not required by this paragraph, employment records that indicate that an employee has successfully completed the required training are one way of keeping track of when an employee has demonstrated proficiency.
 - 2) For an employee with previous training, an employer may determine that that employee has demonstrated the proficiency required by this paragraph using the following process:
 - 3) Confirm that the employee has the training required by paragraph (b) of this section,
 - 4) Use an examination or interview to make an initial determination that the employee understands the relevant safety- related work practices before he or she performs any work covered by this subpart, and
 - 5) Supervise the employee closely until that employee has demonstrated proficiency as required by this paragraph.

115.3 Safety Compliance

Supervision annual performance appraisal shall be conducted at least on an annual basis. This is to determine that each employee is complying with the safety-related work practices that are required.

115.4 Additional Training and Retraining

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

- a) If supervision and annual inspection indicate that the employee is not complying with safety-related work practices.
- b) If new technology, new procedures, or changes in procedures cause new safety-related work practices to be introduced.
- c) If the employee must use safety-related work practices that they do not normally use (used less than once a year).

115.5 Job Briefings

(a) Before each job.

(1) Information provided by the employer.

In assigning an employee or a group of employees to perform a job, the employer shall provide the employee in charge of the job with all available information that relates to the determination of existing characteristics and conditions required by:

(2) Existing characteristics and conditions.

Existing characteristics and conditions of electric lines and equipment that are related to the safety of the work to be performed shall be determined before work on or near the lines or equipment is started. Such characteristics and conditions include, but are not limited to:

- (1) The nominal voltages of lines and equipment,

- (2) The maximum switching-transient voltages,
- (3) The presence of hazardous induced voltages,
- (4) The presence of protective grounds and equipment grounding conductors,
- (5) The locations of circuits and equipment, including electric supply lines, communication lines, and fire protective signaling circuits,
- (6) The condition of protective grounds and equipment grounding conductors,
- (7) The condition of poles, and
- (8) Environmental conditions relating to safety.

(3) *Briefing by the employee in charge.*

The employer shall ensure that the employee in charge conducts a job briefing that meets paragraphs (b), (c), and (d) of this section with the employees involved before they start each job.

(b) *Subjects to be covered.*

The briefing shall cover at least the following subjects:

- ✓ Hazards associated with the job,
- ✓ work procedures involved,
- ✓ special precautions,
- ✓ energy-source controls, and
- ✓ personal protective equipment requirements.

(1) “Location Specifics”.

The written briefing shall cover at least the following subjects related to the “location” of the job:

- 1) Address (generalization may be necessary for remote crew locations),
- 2) Legal location or nearest crossroads,
- 3) Distance from landmark(s),
- 4) GPS Coordinates.
- See NESC Section 421 for more information.

(c) *Number of briefings.*

(1) *At least one before each day or shift.*

If the work or operations to be performed during the work day or shift are repetitive and similar, at least one job briefing shall be conducted before the start of the first job of each day or shift.

(2) *Additional briefings.*

Additional job briefings shall be held if significant changes, which might affect the safety of the employees, occur during the course of the work.

(d) *Extent of briefing.*

(1) *Short discussion.* A brief discussion is satisfactory if the work involved is routine and if the employees, by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job.

(2) *Detailed discussion.* A more extensive discussion shall be conducted:

- (i)** If the work is complicated or particularly hazardous, or
- (ii)** If the employee cannot be expected to recognize and avoid the hazards involved in the job.

Note to paragraph (d): The briefing must address all the subjects listed in paragraph (b) of this section.

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

(f) Refer to OSHA Best Practice: Job Briefings, OSHA Standard 1910.269(c), NFPA 70E 110.7(G) and NESC, ANSI C-2 – Part 4.

115.6 Pole Top Rescue

Electric contacts may occur at elevated locations. When such a contact does happen, immediate rescue is necessary. Rescue operations will vary, depending upon the prevailing situation. The information in this section is intended to serve only as a guide. Preplanning and training for a possible emergency is important.

- a) Size up the situation. The rescue effort will be far more effective if a few seconds are devoted to full identification of the situation.
- b) Radio for help. Call 911 or local emergency number.
- c) Protect yourself. Apply necessary protective equipment. Use necessary personal protective devices, then clear the victim from the hazards.
- d) Position yourself for rescue.
- e) Proceed with rescue as dictated by the conditions:
 - (1) If victim is conscious:
 - Reassure the injured.
 - Be watchful for shock.
 - Secure injured person with a hand line.
 - Help injured descend the pole.
 - Administer first aid.
 - (2) If victim is unconscious and breathing:
 - Watch breathing closely.
 - Lower injured to ground.
 - Give first aid as needed.
 - (3) If victim is unconscious and not breathing:
 - Lower the victim to the ground as soon as possible and initiate CPR.
- f) Lowering victim from the pole:
 - (1) For field expediency, the following method is presented:
 - Break hand line at material hook, drop block to ground and lay hand-line rope on crossarm, preferably 2 or 3 feet from pole.
 - Wrap working line twice around fall line.
 - Pass the hand line under armpits.
 - Tie three half-hitches.
 - Cinch line tightly around victim.
 - Remove slack in line.
 - Cut victim's safety strap.
 - Lower victim.
 - (2) Depending upon the situation, alternate hitching or lowering methods might be more desirable. For example, when rescuing a victim from a pole structure with vertical or

non-crossarm construction, use the same victim approach and medical check as previously mentioned:

- Create an anchor point 2 or 3 feet above the victim's safety strap for the hand-line using hardware or a screwdriver as appropriate.
- Break the hand line at the material hook and drop the block to the ground while maintaining positive control of the snaphook end.
- Wrap the line around the pole above the anchor point with the fall line end over the snaphook end and pull plenty of slack.
- Pass the hand line under the victim's armpits and tie using three half-hitches. Remove slack out of the line.
- Take a firm hold of the fall line, cut the victim's pole strap, and lower the victim to the ground.

Note: For more information, refer to APPA's instructional DVD safety series, "SafetySmart," which is available through APPA's Product Store at www.publicpower.org/store.

115.7 Bucket Truck/Aerial Lift Rescue

Grand Valley Power has a policy on which bucket truck rescue method is appropriate for its work environment; it is crucial for GVP employees to be trained in emergency response procedures and to practice them. Rescue operations will vary, depending on the prevailing situation. The information in this section is intended to serve only as a guide. Preplanning and training for a possible emergency is important.

If a medical emergency occurs when working out of a bucket truck, it is vital to lower the victim quickly to the ground. Below are three bucket-truck/aerial lift rescue techniques that can be used to remove a victim from a bucket and lower him to the ground. In all scenarios, the rescuer should verify that the truck is not in contact with energized conditions before approaching the truck.

- a) Rescue with Rescue Blocks:
 - (1) The groundman/rescuer will use rescue blocks to assist in the rescue.
 - (2) Once the bucket is lowered and positioned so that the groundman/rescuer can access the victim, the groundman/rescuer pulls the rescue blocks from storage.
 - (3) He should remove the victim's lanyard from the anchor point and attach the rescue block's snaphook to the victim's harness attachment point.
 - (4) The rescuer will pull the fall line with the blocks to raise the victim out of the bucket.
 - (5) The victim can now be lowered to the ground by allowing slack in the rescue blocks. Emergency aid can now be given to the victim.
- b) Rescue with Tilt Bucket:
 - (1) The groundman/rescuer will rescue a victim using a bucket truck equipped with a tilt or dump bucket.
 - (2) Once the bucket is lowered and positioned so that the groundman/rescuer can access the victim, the groundman/rescuer should remove the tool board from the bucket to avoid further injury to the victim.
 - (3) The groundman/rescuer should then unhook the victim's lanyard from the anchor point, tilt the bucket, and pull the victim from the bucket. Emergency aid can now be given to the victim.
- c) Rescue with Hand Line Hanging on Pole:

- (1) The groundman/rescuer will use the hand line which the lineman was using to assist in the rescue.
- (2) After the bucket is lowered, the groundman/rescuer can get into the bucket with the victim and operate the bucket up to the pole near the hand line.
- (3) The groundman/rescuer unhooks the victim's lanyard from the anchor point and attaches the hand line's snaphook to the victim's harness attachment point. (Rescuers should wear fall protection in accordance with GVP policy.)
- (4) The groundman/rescuer should twist the fall line at least three turns and hook the resulting eye into a carabineer at the lanyard attachment point on the boom. Be sure to remove slack while holding the fall line on the hand line, then lower the bucket from under the victim.
- (5) The victim can now be lowered to the ground by allowing slack on the hand line. Emergency aid can now be given to the victim.

115.8 After Rescue

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

115.9 Training in Resuscitation and Rescue

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

PART 2 HEALTH AND ENVIRONMENTAL CONTROL

PART 2 HEALTH AND ENVIRONMENTAL CONTROL

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

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

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

201 Confined or Enclosed Spaces

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

- Contains or has a potential to contain a hazardous atmosphere(s);
- Contains a material that has the potential for engulfing an entrant;
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross section; or
- Contains any other recognized serious safety or health hazard.

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

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

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

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

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

e) Before 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.

1) Calibration of Test Instruments.

Test instruments used to monitor atmospheres in enclosed spaces shall be kept in calibration and shall have a minimum accuracy of ± 10 percent.

f) If a hazard increasing work activity is to take place in a confined or enclosed space (i.e., welding, painting, working with solvents and coating), the air in the space shall be continuously tested for the presence of flammable or toxic gases and vapors or insufficient oxygen. The forced-air ventilation shall be so directed as to ventilate the immediate area where employees are present within the enclosed space and shall continue until all employees leave the enclosed space.

- g) If flammable or toxic gases or vapors are detected or if an oxygen deficiency is found, the space shall be continuously tested and forced ventilation shall be used to maintain oxygen at a safe level and to prevent a hazardous concentration of flammable or toxic gases and vapors. The forced-air ventilation shall be so directed as to ventilate the immediate area where employees are present within the enclosed space and shall continue until all employees leave the enclosed space
- h) While work is being performed in an enclosed space, a person with CPR and basic first-aid training shall be immediately available to render emergency assistance if there is reason to believe that a hazard may exist in the space or if a hazard exists because of traffic patterns in the area of the opening used for entry. If work is to be performed in a confined space, GVP's written permit system shall be followed. A properly trained attendant shall be stationed outside the confined space. The attendant shall maintain continuous communication with the employees authorized to be in the confined space. The attendant shall be able to recognize confined space hazards and changing conditions in the confined space that could affect employees in the space. In the event of an emergency, the attendant shall not enter the confined space, but shall be able to summon emergency and rescue services.
- i) Entry into a confined or enclosed space with an unsafe atmosphere shall be avoided if at all possible. Employees required to enter a confined or enclosed space with an unsafe atmosphere shall be equipped with 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.
- j) Electric welding, gas welding, cutting, or any other hot work shall not be performed on the interior, exterior, or near the openings of any confined or enclosed space that may contain flammable or explosive gases or vapors until the space has been properly cleared.
- k) Compressed gas bottles shall not be taken into a confined space.
- l) Safe access to the confined space shall be maintained at all times. If possible, all cords, hoses, leads, etc., shall be routed through an entrance other than the employee access into the confined space.
- m) Before employees are allowed to enter a confined space, all electrical and mechanical energy sources that could affect the employees working in the space shall be physically rendered inoperative, locked out, and tagged. If required, the space shall be drained, vented, and cleaned.
- n) For additional information concerning confined space requirements, refer to OSHA Standards 29 CFR 1910.269 and 29 CFR 1910.146.

202 Hazardous Energy Control (Lockout/Tagout) Procedures

Grand Valley Power has its own policy to ensure proper hazardous energy control (lockout/tagout). The GVP policy shall establish a program consisting of energy control procedures, employee training, and periodic inspections to ensure that, before any employee performs any servicing or maintenance on a machine or equipment where the unexpected energizing, startup, or release of stored energy could occur and cause injury, the machine or equipment is isolated from the energy source and rendered inoperative. Refer to Section 202, Hazardous Energy Control (Lockout/Tagout) Procedures, in its entirety for proper authorization and work procedures.

Hazardous energy control procedures for the de-energizing of electric energy sources that are used exclusively for purposes of transmission and distribution are addressed by Section 202.1, Hazardous Energy Control (Lockout/Tagout) De-energizing Lines and Equipment. Hazardous energy control procedures for the control of energy sources in installations for the purpose of electric power generation, including related equipment for communication or metering, are

addressed by Section 202.2, Hazardous Energy Control (Lockout/Tagout) Servicing and Maintenance of Machines and Equipment.

For additional information please refer to OSHA 1910.269, 1910.147 and Appendices A and B of this *Manual*.

Only GVP employees properly trained and qualified in the knowledge and skills required for the safe application, usage, and removal of energy controls shall perform hazardous energy control work. All safety rules of the GVP must be known and followed by each employee. Employees are expected to use judgment, common sense, and diligence in following these rules. For the purposes of this section, a control authority, dispatch officer, or operator shall hereafter be referred to by the term “system operator.”

a) Before work starts, conductors and parts of electric equipment shall be treated as energized until they are confirmed de-energized. This includes a visual inspection of all equipment for damage and identification of possible problems before starting work or switching. Lines, cables, stations, or equipment can be considered de-energized and ready for work only after the equipment has been identified and isolated, a clearance has been issued, and the equipment has been tested and grounded.

b) Any disconnecting means that are accessible to persons outside the employer’s control (for example, the general public) shall be rendered inoperable while they are open to protect employees.

c) No switch, governor, valve, throttle, or other device used to put a circuit or equipment into service shall be operated while a Hold Card or similar device is attached to it. A Hold Card placed on an open switch or any other type of energy-isolating device forbids closing that device. No one, regardless of rank or authority, shall in any case operate any switch or piece of equipment that has a Hold Card attached to it, nor shall the Hold Card be removed without orders from the authorized system operator or supervisor.

d) A Hold Card, or similar device, that has been placed for the protection of workers shall be removed only when proper authorization has been received and workers and tools are in the clear. (Follow GVP operating instructions pertaining to the equipment involved.)

e) Employees shall observe the following authorization procedures when performing hazardous energy control for lines and equipment:

(1) If a system operator is in charge of the lines or equipment and their means of disconnection, all of the requirements of Section 202.1 shall be observed, in the order given.

(2) If no system operator is in charge of the lines or equipment and their means of disconnection, one employee in the crew shall be designated as being in charge of the clearance. All of the requirements of Section 202.1 apply, in the order given, except as provided in part (3) of this section. The employee in charge of the clearance shall take the place of the system operator, as necessary.

(3) If only one crew will be working on the lines or equipment and if the means of disconnection is accessible and visible to and under the sole control of the employee in charge of the clearance, Section 202.1 b) (1), (3), (4), (8), and (12) do not apply. Additionally, tags required by the remaining provisions of Section 202.1 need not be used.

f) Multiple Crews.

If two or more crews will be working on the same lines or equipment, then:

(i) The crews shall coordinate their activities under this section with a single employee in charge of the clearance for all of the crews and follow the requirements of this section as if all of the employees formed a single crew, or

(ii) Each crew shall independently comply with this section and, if there is no system operator in charge of the lines or equipment, shall have separate tags and coordinate de-energizing and reenergizing the lines and equipment with the other crews.

202.1 Hazardous Energy Control (Lockout/Tagout) De-energizing Lines and Equipment

Section 202.1 applies to hazardous energy control (lockout/tagout) procedures for the de-energizing of electric energy sources that are used exclusively for purposes of transmission and distribution of electricity. Employees shall read Section 202 in its entirety for proper authorization and work procedures.

Grand Valley Power has its own policy to ensure proper Hazardous Energy Control (Lockout/Tagout) for de-energizing lines and equipment.

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) To ensure proper hazardous energy control when de-energizing lines and equipment, the following steps will be followed, in the order given, except as determined by Section 202 e):

(1) An employee designated by GVP shall request the system operator 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.

(2) All switches, disconnectors, jumpers, taps, and other means through which known sources of electric energy may be supplied to the particular lines and equipment to be 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.

(3) 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.

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

(5) After the applicable requirements in Parts (1) through (4) of Section 202.1 b) have been followed and the employee in charge of the work has been given a clearance by the system operator, the lines and equipment to be worked shall be tested to ensure that they are de-energized.

(6) Protective grounds shall be installed (refer to OSHA Standard 29 CFR 1910.269(n)).

(7) After the applicable requirements of Parts (1) through (6) of Section 202.1 b) have been followed, the lines and equipment involved may be worked as de-energized.

(8) If two or more independent crews will be working on the same lines or equipment, each crew shall independently comply with the requirements in of this section.

(9) 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 the system operator; employees in the crew shall be informed of the transfer; and the new employee in charge shall be responsible for the clearance.

(10) 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 the system operator and release the clearance.
- (11) The person releasing a clearance shall be the same person that requested the clearance, unless responsibility has been transferred per Section 202.1 b) (9).
- (12) Tags may not be removed unless the associated clearance has been released per Section 202.1 10).
- 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. Grand Valley Power should have a procedure or method to ensure proper transfer of clearance during times when the clearance holder is unavailable.*
- (13) 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 concerning Hold Cards and tag requirements, refer to OSHA Standards 29 CFR 1910.269 and 29 CFR 1910.147.

202.2 Hazardous Energy Control (Lockout/Tagout) Servicing and Maintenance of Machines and Equipment

Section 202.2 applies to hazardous energy control (lockout/tagout) procedures for the control of energy sources in electric power generation installations, including other related equipment for uses such as communication or metering. Employees shall read Section 202 in its entirety for proper authorization and work procedures.

Grand Valley Power shall have its own policy to ensure proper hazardous energy control (lockout/tagout) for servicing and maintenance of machines and equipment.

- 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. When tagout systems are used, employees shall also be trained in the limitations of tags.
- b) If an energy isolating device is capable of being locked out, the lockout system shall be used, unless it can be demonstrated that the utilization of a tagout system will provide full employee protection.
- c) If an energy isolating device is not capable of being locked out, a tagout system shall be used. Tagging should offer the same degree of protection as locking. This may require additional safety measures such as removal of an isolating circuit, blocking of a control switch, opening of an extra disconnecting device or the removal of a valve handle.
- d) Lockout or tagout shall be performed only by the authorized employees who are performing the servicing or maintenance. Affected employees shall be notified of the application and removal of lockout or tagout devices. Notifications shall be given before controls are applied and after they are removed. Another notification must occur before the machine or equipment is re-energized.
- e) The sequence to apply lockout/tagout is as follows:

- (1) Before an authorized or affected employee turns off a machine or equipment, the authorized employee shall have knowledge of the type and magnitude of the energy, the hazards of the energy to be controlled, and the method or means to control it.
- (2) The machine or equipment shall be turned off or shut down using the procedures established for the machine or equipment.
- (3) All energy isolating devices that are needed to control the energy to the machine or equipment shall be physically located and operated in such a manner as to isolate the machine or equipment from the energy source(s).
- (4) Lockout or tagout devices shall be affixed to each energy-isolating device by authorized employees.
- (5) Lockout devices, where used, shall be affixed in a manner to that will hold the energy isolating devices in a "safe" or "off" position.
- (6) Tagout devices, where used, shall be affixed in such a manner as will clearly indicate that the operation or movement of energy isolating devices from the "safe" or "off" position is prohibited.
- (7) Where tagout devices are used with energy isolating devices designed with the capability of being locked, the tag attachment shall be fastened at the same point at which the lock would have been attached.
- (8) Where a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.
- (9) After the application of lockout or tagout devices to energy isolating devices, all potentially hazardous stored or residual energy shall be relieved, disconnected, restrained, and otherwise rendered safe.
- (10) If there is a possibility of reaccumulation of stored energy to a hazardous level, verification of isolation shall be continued until the servicing or maintenance is completed, or until the possibility of such accumulation no longer exists.
- (11) Before starting work on machines or equipment that have been locked out or tagged out, the authorized employee shall verify that isolation and de-energization of the machine or equipment have been accomplished.

f) When servicing and/or maintenance is performed by a crew, craft, department or other group, they shall utilize a procedure which affords the employees a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device. Group lockout or tagout devices shall be used in accordance with the procedures required by Section 202.2 b) including, but not necessarily limited to, the following specific requirements:

- (1) Primary responsibility is vested in an authorized employee for a set number of employees working under the protection of a group lockout or tagout device (such as an operations lock).
- (2) Provision is made for the authorized employee to ascertain the exposure status of individual group members with regard to the lockout or tagout of the machine or equipment.
- (3) When more than one crew, craft, department, etc., is involved, assignment of overall job-associated lockout or tagout control responsibility is vested in an authorized employee designated to coordinate affected work forces and ensure continuity of protection.

(4) Each authorized employee shall affix a personal lockout or tagout device to the group lockout device, group lockbox, or comparable mechanism when he or she begins work and shall remove those devices when he or she stops working on the machine or equipment being serviced or maintained.

Note: Specific procedures shall be utilized during shift or personnel changes to ensure the continuity of lockout or tagout protection, including provision for the orderly transfer of lockout or tagout device protection between off-going and oncoming employees, to minimize exposure to hazards from the unexpected energization or startup of the machine or equipment, or the release of stored energy.

g) Before lockout or tagout devices are removed and energy is restored to the machine or equipment, procedures shall be followed and actions taken by the authorized employee(s) to ensure the following:

(1) The work area shall be inspected to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

(2) The work area shall be checked to ensure that all employees have been safely positioned or removed.

(3) After lockout or tagout devices have been removed and before a machine or equipment is started, affected employees shall be notified that the lockout or tagout device(s) have been removed.

(4) Each lockout or tagout device shall be removed from each energy isolating device by the employee who applied the device.

(5) If the authorized employee who applied the lockout or tagout device is not available to remove it, that device may be removed under the direction of the employee's next higher 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. Grand Valley Power has a procedure or method to ensure proper transfer of clearance during times when the clearance holder is unavailable. The specific procedure for removal shall provide equivalent safety to the removal of the device by the authorized employee who applied it. The specific procedure shall include at least the following elements:

(a) Verification by the next higher supervisor that the authorized employee who applied the device is not at the facility.

(b) Making all reasonable efforts to contact the authorized employee to inform him/her that his/her lockout or tagout device has been removed.

(c) Ensuring that the authorized employee has this knowledge before he/she resumes work at that facility.

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

e) Whenever outside servicing personnel are used, they and GVP shall inform each other of their respective lockout/tagout procedures and ensure that employees from both sides understand and comply with each other's procedures.

f) If energy isolating devices are installed in a central location under the exclusive control of a control authority or system operator, the following requirements shall apply:

- (1) The procedure shall afford employees with a level of protection equivalent to that provided by a personal lockout/tagout device.
- (2) The system operator shall place and remove lockout/tagout devices in place of the authorized employee.
- (3) Provisions shall be made to identify the authorized employee who is responsible for (that is, being protected by) the lockout or tagout device, to transfer responsibility for lockout and tagout devices. Provisions shall also be made to ensure that an authorized employee requesting removal or transfer of a lockout/tagout device is the one responsible for it before the device is removed or transferred.

202.3 Hazardous Energy Control (Lockout/Tagout) Device Requirements

Section 202.3 covers lockout/tagout device requirements. See Appendix A –Hazardous Energy Control (lockout/tagout) program requirements for information on lockout/tagout device-related training. Employees shall be familiar with the application of lockout and devices and shall not apply devices that are not suitable.

- a) Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware shall be appropriate for isolating, securing or blocking of machines or equipment from energy sources.
- b) Lockout devices and tagout devices shall be singularly identified, shall be the only device(s) used for controlling energy, shall not be used for other purposes, and shall meet the following requirements:
 - (1) Lockout and tagout devices shall be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.
 - (2) Tagout devices shall be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.
 - (3) Tags shall not deteriorate when used in corrosive environments such as areas where acid and alkali chemicals are handled and stored.
 - (4) Lockout and tagout devices shall be standardized within the facility in at least one of the following criteria: color; shape; or size; and additionally, in the case of tagout devices, print and format shall be standardized.
 - (5) Lockout devices shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.
 - (6) Tagout devices, including their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal. Tagout device attachment means shall be of a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds and having the general design and basic characteristics of being at least equivalent to a one-piece, all environment-tolerant nylon cable tie.
- c) Lockout devices and tagout devices shall indicate the identity of the employee applying the device(s).
- d) Tagout devices shall warn against hazardous conditions if the machine or equipment is energized and shall include a legend such as the following: *Do Not Start. Do Not Open. Do Not Close. Do Not Energize. Do Not Operate.*

203 Fall Protection

New - Personal Protective Equipment.

(a) General.

Personal protective equipment shall meet the requirements of Subpart E of this part.

Note to paragraph (a): Paragraph (d) of § 1926.95 sets employer payment obligations for the personal protective equipment required by this subpart, including, but not limited to, the fall protection equipment required by paragraph (b) of this section, the electrical protective equipment required by § 1926.960(c), and the flame-resistant and arc-rated clothing and other protective equipment required by § 1926.960(g).

(b) Fall Protection.

(1) Personal Fall Arrest Systems.

(i) Personal fall arrest systems shall meet the requirements of Subpart M of this part.

(ii) Personal fall arrest equipment used by employees who are exposed to hazards from flames or electric arcs, as determined by the employer under § 1926.960(g)(1), shall be capable of passing a drop test equivalent to that required by paragraph (b)(2)(xii) of this section after exposure to an electric arc with a heat energy of 40 ± 5 cal/cm².

(2) Work-Positioning Equipment. Body belts and positioning straps for work positioning equipment shall meet the following requirements:

(i) Hardware for body belts and positioning straps shall meet the following requirements:

(A) Hardware shall be made of drop forged steel, pressed steel, formed steel, or equivalent material.

(B) Hardware shall have a corrosion resistant finish.

(C) Hardware surfaces shall be smooth and free of sharp edges.

(ii) Buckles shall be capable of withstanding an 8.9-kilonewton (2,000-pound-force) tension test with a maximum permanent deformation no greater than 0.4 millimeters (0.0156 inches).

(iii) D rings shall be capable of withstanding a 22-kilonewton (5,000-pound-force) tensile test without cracking or breaking.

(iv) Snaphooks shall be capable of withstanding a 22-kilonewton (5,000-pound-force) tension test without failure.

Note to paragraph (b)(2)(iv): Distortion of the snaphook sufficient to release the keeper is considered to be tensile failure of a snaphook.

(v) Top grain leather or leather substitute may be used in the manufacture of body belts and positioning straps; however, leather and leather substitutes may not be used alone as a load-bearing component of the assembly.

(vi) Plied fabric used in positioning straps and in load-bearing parts of body

(viii) The cushion part of the body belt shall contain no exposed rivets on the inside and shall be at least 76 millimeters (3 inches) in width.

(ix) Tool loops shall be situated on the body of a body belt so that the 100 millimeters (4 inches) of the body belt that is in the center of the back, measuring from D ring to D ring, is free of tool loops and any other attachments.

(x) Copper, steel, or equivalent liners shall be used around the bars of D rings to prevent wear between these members and the leather or fabric enclosing them.

(xi) Snaphooks shall be of the locking type meeting the following requirements:

(A) The locking mechanism shall first be released, or a destructive force shall be placed on the keeper, before the keeper will open.

(B) A force in the range of 6.7 N (1.5 lbf) to 17.8 N (4 lbf) shall be required to release the locking mechanism.

(C) With the locking mechanism released and with a force applied on the keeper against the face of the nose, the keeper may not begin to open with a force of 11.2 N (2.5 lbf) or less and shall begin to open with a maximum force of 17.8 N (4 lbf).

(xii) Body belts and positioning straps shall be capable of withstanding a drop test as follows:

(A) The test mass shall be rigidly constructed of steel or equivalent material with a mass of 100 kg (220.5 lbm). For work-positioning equipment used by employees weighing more than 140 kg (310 lbm) fully equipped, the test mass shall be increased proportionately (that is, the test mass must equal the mass of the equipped worker divided by 1.4).

(B) For body belts, the body belt shall be fitted snugly around the test mass and shall be attached to the test structure anchorage point by means of a wire rope.

(C) For positioning straps, the strap shall be adjusted to its shortest length possible to accommodate the test and connected to the test-structure anchorage point at one end and to the test mass on the other end.

(D) The test mass shall be dropped an unobstructed distance of 1 meter (39.4 inches) from a supporting structure that will sustain minimal deflection during the test.

(E) Body belts shall successfully arrest the fall of the test mass and shall be capable of supporting the mass after the test.

(F) Positioning straps shall successfully arrest the fall of the test mass without breaking, and the arrest force may not exceed 17.8 kilonewtons (4,000 pounds-force). Additionally, snaphooks on positioning straps may not distort to such an extent that the keeper would release.

Note to paragraph (b)(2): When used by employees weighing no more than 140 kg (310 lbm) fully equipped, body belts and positioning straps that conform to American Society of Testing and Materials *Standard Specifications for Personal Climbing Equipment*, ASTM F887–12e1, are deemed to be in compliance with paragraph (b)(2) of this section.

(3) Care and use of personal fall protection equipment.

(i) Workpositioning equipment shall be inspected before use each day to determine that the equipment is in safe working condition. Work-positioning equipment that is not in safe working condition may not be used.

Note to paragraph (b)(3)(i): Appendix F to this subpart contains guidelines for inspecting work-positioning equipment.

(ii) Personal fall arrest systems shall be used in accordance with § 1926.502(d).

Note to paragraph (b)(3)(ii): Fall protection equipment rigged to arrest falls is considered a fall arrest system and must meet the applicable requirements for the design and use of those systems. Fall protection equipment rigged for work positioning is considered work-positioning equipment and must meet the applicable requirements for the design and use of that equipment.

(iii) The employer shall ensure that employees use fall protection systems as follows:

(A) Each employee working from an aerial lift shall use a fall restraint system or a personal fall arrest system. Paragraph (b)(2)(v) of § 1926.453 does not apply.

(B) Except as provided in paragraph (b)(3)(iii)(C) of this section, each employee in elevated locations more than 1.2 meters (4 feet) above the ground on poles, towers, or similar structures shall use a personal fall arrest system, work-positioning equipment, or fall restraint system, as appropriate, if the employer has not provided other fall protection meeting Subpart M of this part.

(C) Until March 31, 2015, a qualified employee climbing or changing location on poles, towers, or similar structures need not use fall protection equipment, unless conditions, such as, but not limited to, ice, high winds, the design of the structure (for example, no provision for holding on with hands), or the presence of contaminants on the structure, could cause the employee to lose his or her grip or footing. On and after April 1, 2015, each qualified employee 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.

Note 1 to paragraphs (b)(3)(iii)(B) and (b)(3)(iii)(C): These paragraphs apply to structures that support overhead electric power transmission and distribution lines and equipment. They do not apply to portions of buildings, such as loading docks, or to electric equipment, such as transformers and capacitors. Subpart M of this part contains the duty to provide fall protection associated with walking and working surfaces.

Note 2 to paragraphs (b)(3)(iii)(B) and (b)(3)(iii)(C): Until the employer ensures that employees are proficient in climbing and the use of fall protection under § 1926.950(b)(7), the employees are not considered “qualified employees” for the purposes of paragraphs (b)(3)(iii)(B) and (b)(3)(iii)(C) of this section.

These paragraphs require unqualified employees (including trainees) to use fall protection any time they are more than 1.2 meters (4 feet) above the ground.

(iv) On and after April 1, 2015, work positioning systems shall be rigged so that an employee can free fall no more than 0.6 meters (2 feet).

(v) Anchorages for work-positioning equipment shall be capable of supporting at least twice the potential impact load of an employee's fall, or 13.3 kilonewtons (3,000 pounds-force), whichever is greater.

Note to paragraph (b)(3)(v): Wood-pole fall-restriction devices meeting American Society of Testing and Materials *Standard Specifications for Personal Climbing Equipment*, ASTM F887–12e1, are deemed to meet the anchorage-strength requirement when they are used in accordance with manufacturers' instructions.

(vi) Unless the snaphook is a locking type and designed specifically for the following connections, snaphooks on work-positioning equipment may not be engaged:

(A) Directly to webbing, rope, or wire rope;

(B) To each other;

(C) To a D ring to which another snaphook or other connector is attached;

(D) To a horizontal lifeline; or

(E) To any object that is incompatibly shaped or dimensioned in relation to the snaphook such that accidental disengagement could occur should the connected object sufficiently depress the snaphook keeper to allow release of the object. Belts shall be constructed in such a way that no raw edges are exposed and the plies do not separate.

(vii) Positioning straps shall be capable of withstanding the following tests:

(A) A dielectric test of 819.7 volts, AC, per centimeter (25,000 volts per foot) for 3 minutes without visible deterioration;

(B) A leakage test of 98.4 volts, AC, per centimeter (3,000 volts per foot) with a leakage current of no more than 1 mA;

Note to paragraphs (b)(2)(vii)(A) and (b)(2)(vii)(B): Positioning straps that pass direct-current tests at equivalent voltages are considered as meeting this requirement.

(C) Tension tests of 20 kilonewtons (4,500 pounds-force) for sections free of buckle holes and of 15 kilonewtons (3,500 pounds-force) for sections with buckle holes;

(D) A buckle-tear test with a load of 4.4 kilonewtons (1,000 pounds-force); and

(E) A flammability test in accordance with Table V–1.

203.1 Appendix F to Subpart V of Part 1926—

Work-Positioning Equipment Inspection

Guidelines

I. Body Belts Inspect body belts to ensure that:

A. The hardware has no cracks, nicks, distortion, or corrosion;

B. No loose or worn rivets are present;

C. The waist strap has no loose grommets;

D. The fastening straps are not 100-percent leather; and

E. No worn materials that could affect the safety of the user are present.

II. Positioning Straps Inspect positioning straps to ensure that:

- A. The warning center of the strap material is not exposed;
- B. No cuts, burns, extra holes, or fraying of strap material is present;
- C. Rivets are properly secured;
- D. Straps are not 100-percent leather; and
- E. Snaphooks do not have cracks, burns, or corrosion.

III. Climbers Inspect pole and tree climbers to ensure that:

- A. Gaffs are at least as long as the manufacturer's recommended minimums (generally 32 and 51 millimeters (1.25 and 2.0 inches) for pole and tree climbers, respectively, measured on the underside of the gaff);

Note: Gauges are available to assist in determining whether gaffs are long enough and shaped to easily penetrate poles or trees.

- B. Gaffs and leg irons are not fractured or cracked;
- C. Stirrups and leg irons are free of excessive wear;
- D. Gaffs are not loose;
- E. Gaffs are free of deformation that could adversely affect use;
- F. Gaffs are properly sharpened; and
- G. There are no broken straps or buckles.

- j) For additional information concerning fall protection requirements, refer to Section 507.3, Climbing and Working on Poles, and OSHA Standards 29 CFR 1910.269; 1910.66 App. C; 1926.451; 1926.500; 1926.501; 1925.502; 1926.502 Subpart R App. G(b-e); 1926.502 Subpart M App. B-D; 1926.760; 1926.761; 1926.1423; 1926.1423.

204 Lighting

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

205 Exhaust Ventilation

- a) Exhaust systems, when provided at the work location, shall be used.
- b) When an exhaust system does not provide adequate protection, other protective means, such as an approved respirator, shall be used in addition to (or in lieu of) the exhaust system.
- c) For additional information concerning ventilation requirements, refer to OSHA Standard 29 CFR 1910.94.

206 Hours of Service

- a) No employee should work more than a total of 16 hours time on duty, immediately preceded by 8 or more consecutive hours off duty time, except under emergency conditions, as determined by GVP.
- b) Duty begins when the employee reports to work and ends when the worker is released from work, and includes breaks, interim periods, or time spent engaged in any service for the employer.

207 Fire Protection

207.1 Fire Protection and Emergency Plans

- a) Employees shall become familiar with and follow all GVP emergency procedures and plans.
- b) Employees shall familiarize themselves with the emergency exits, alarm signals, and escape procedures when working inside a building or structure.
- c) In buildings or structures, all fire exits and escape routes shall be visibly marked and shall be kept free of obstructions. Fire exits or doors shall not be locked, chained, or barricaded at any time.
- d) Employees shall be familiar with both the location and the operation of all fire protection equipment in the vicinity of their work area.
- e) Fire protection equipment shall be properly located at all times. Except for actual use, employees shall not move or remove such equipment without proper authority.
- f) Only properly trained employees equipped with the necessary protective equipment shall attempt to extinguish or contain a fire.
- g) For additional information concerning fire protection and emergency plans, refer to OSHA Standards 29 CFR 1910.38 and 29 CFR 1910.156.

207.2 Fire Extinguishers

- a) All employees shall know the classes of fire, their burning characteristics, and the proper extinguishing agent to be used:
 - (1) Class “A” fires involve ordinary combustibles, such as wood, paper, some plastics, and textiles. Extinguishing agents include water, multipurpose dry chemical, high-expansion foams, and Halon.
 - (2) Class “B” fires involve flammable liquid and gas fires, such as oil, gasoline, paint, and grease. Extinguishing agents include carbon dioxide, dry chemical, low-expansion foam, and Halon.
 - (3) Class “C” fires involve energized electrical equipment. Extinguishing agents include carbon dioxide, dry chemical, and Halon.
 - (4) Class “D” fires involve combustible metals, such as magnesium, potassium, zinc, and titanium. Extinguishing agents include dry powder.
- b) Halon is a gaseous extinguishing agent suitable for combating both Class “B” and “C” fires, especially at indoor locations. Both agents are slightly toxic in low concentrations (less than 5 percent) and will cause unconsciousness in a short period of time when the concentration is above 15 percent. When the extinguishing agent is released, precautionary measures similar to those for toxic confined spaces should be used.
- c) Employees shall not enter confined spaces after using carbon dioxide extinguishers until the area has been thoroughly ventilated.
- d) Fire extinguishers must not be blocked or hidden behind material or machines.
- e) All fire extinguishers shall be conspicuously marked and shall be located close to the fire hazard, but not so close that they would be damaged or cut off by the fire.
- f) Extinguishers that contain carbon tetrachloride or chlorobromomethane shall not be used.
- g) Inverted type extinguishers such as self-generating soda acid or self-generating foam or gas cartridge water shall not be used.

- h) All employees shall be trained on the operation of the fire extinguishers in their work area. The following general guidelines shall be considered when using a portable fire extinguisher:
 - (1) Look to see what is burning and be sure to use the correct extinguisher.
 - (2) Approach the fire from upwind if possible. Try to get approximately 6 to 8 feet close to the fire (depending on the size and type of the fire).
 - (3) Hold the extinguisher upright and aim it at the base of the fire.
 - (4) Be efficient. Most fire extinguishers are emptied in a few seconds.
- i) Fire extinguishers shall be inspected visually at least once a month and thoroughly inspected at least annually.
- j) For additional information concerning the requirements for fire extinguishers, refer to OSHA Standard 29 CFR 1910.157.

207.3 Hydrants, Standpipes, and Hose Stations

- a) Vegetation, snow, and stored equipment shall be kept away from hydrants, hydrant houses, and valve and hose stations.
- b) Control valves shall be tested frequently and shall be maintained in the proper position.
- c) Connections should be checked with the local fire department to be sure that they are of a size and thread that will fit their equipment.
- d) Only lined hose shall be used for hose stations.
- e) Fire hose station hose and nozzles shall not be used for any other purpose.
- f) When water flows through a fire hose and nozzle, the reverse action of the nozzle, called “nozzle reaction,” can be considerable, tiring a person in a short period of time. A minimum of two persons should be available to eliminate this effect.
- g) All movements involving an operating hose line shall be accomplished with slow deliberate movements.
- h) The hose line should be kept in line with the direction of the nozzle stream flow. A sharp bend directly behind the nozzle will cause severe pressure to turn the nozzle and create excessive work and potential danger to the user.
- i) After use, all hose shall be thoroughly dried and properly racked in the hose station.
- j) For additional information concerning standpipes, and hose stations, refer to OSHA Standard 29 CFR 1910.158.

207.4 Sprinkler Systems

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

PART 3 CHEMICAL AND PHYSICAL HAZARD CONTROL

PART 3 CHEMICAL AND PHYSICAL HAZARD CONTROL

301 Material Handling and Storage

- a) An employee shall obtain assistance in lifting heavy objects or use power equipment.
- b) When two or more persons carry a heavy object that is to be lowered or dropped, there shall be a prearranged signal for releasing the load.
- c) When two or more persons are carrying an object, each employee, if possible, should face the direction in which the object is being carried. Employees shall not attempt to lift beyond their capacity. Caution shall be taken when lifting or pulling in an awkward position.

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

- d) Employees should avoid twisting or excessive bending when lifting or setting down loads.
- e) When moving a load horizontally, employees should push the load rather than pull it.
- f) When performing a task that requires repetitive lifting, the load should be positioned to limit bending and twisting. The use of lift tables, pallets, and mechanical devices should be considered.
- g) When gripping, grasping, or lifting an object such as a pipe or board, the whole hand and all the fingers should be used. Gripping, grasping, and lifting with just the thumb and index finger should be avoided.
- h) In areas not restricted to qualified employees only, materials and equipment may not be stored closer to energized lines or exposed energized parts of equipment than the following distances plus the maximum sag and side swing of all conductors and providing for the height and movement of material handling equipment:
 - (1) For lines and equipment energized at 50 kV or less, the distance is 10 feet.
 - (2) For lines and equipment energized at more than 50 kV, the distance is 10 feet plus 4 inches for every 10 kV over 50 kV.
- i) Materials stored near energized lines or equipment must meet the spacing requirements of OSHA Standard 29 CFR 1910.269 (k).

303 Compressed Gases

- a) Care shall be exercised in handling all compressed gas cylinders. They shall not be dropped, jarred, or exposed to temperature extremes.
- b) Cylinders shall have the valve cap or valve protection device in place at all times, except when in actual use or connected to a welding set.
- c) Cylinders shall not be rolled and shall not be lifted by the valve or valve cap; a suitable cradle or other device shall be used.
- d) Cylinders shall have their contents properly identified.
- e) Cylinders not having fixed handwheels shall have keys, handles, or nonadjustable wrenches on the valve stems while the cylinders are in service.
- f) Compressed gas cylinders, whether full or empty, shall be stored in an upright position and chained or otherwise secured so that they cannot fall or be upset.
- g) When cylinders are transported by powered vehicles, they shall be secured in a vertical upright position with the valve cap or valve protection device in place.

- h) Oxygen cylinders in storage shall be separated from fuel-gas cylinders or combustible materials (especially oil or grease) by a minimum distance of 20 feet or by a 5 foot high noncombustible barrier.
- i) Cylinders shall not be placed where they might become part of an electric circuit or within 5 feet of an electrical outlet.
- j) Inside a building, hydrogen and fuel-gas cylinders, except those in actual use or attached ready for use, shall be limited to a total gas capacity of 2,000 cubic feet (56 m³) or 300 pounds (135.9 kg) of liquefied petroleum. For more information, please see OSHA Standard 29 CFR 1910.253(b)(3).
- k) Employees shall never force connections that do not fit nor shall they tamper with the safety relief devices of cylinder valves.
- l) Before the regulator is removed from a cylinder, the valve shall be closed and all pressure released from the regulator.
- m) A leaking cylinder shall not be used. Such cylinders shall be taken outdoors away from sources of ignition. The supervisor shall be notified.
- n) A flame shall never be used to detect gas leaks.
- o) The recessed top of cylinders shall not be used as a place for tools.
- p) No attempt shall be made to mix gases in a cylinder or to transfer gas from one cylinder to another.
- q) A sign "Danger--No Smoking, Matches, or Open Lights" or one with equivalent wording shall be conspicuously posted in rooms or at entrances to areas where fuel gas is used and/or stored.
- r) Hydrogen: Special precautions shall be taken when using hydrogen to avoid the possibility of fire and explosion. "Danger--No Smoking" signs shall be posted where hydrogen is used and/or stored.
- s) Oxygen: Oil, grease, or similar materials shall not be allowed to come in contact with any valve, fitting, regulator, or gauge of oxygen cylinders:
 - (1) Oxygen shall never be used as a substitute for compressed air.
 - (2) When an oxygen cylinder is in use, the valve should be opened fully to prevent leakage around the valve stem.
- t) Acetylene: Acetylene cylinders shall be properly secured and always used, transported, or stored in a vertical position. Cylinders shall be protected from sparks, flames, and contact with electrical equipment:
 - (1) An acetylene cylinder valve shall not be opened more than one and one-half turns of the spindle and preferably no more than three-fourths of a turn.
 - (2) Employees shall not use acetylene in a free state at pressures higher than 15 psi.
- u) Chlorine: Also refer to Section 312, Chlorine:
 - (1) Chlorine containers shall be stored and properly secured in a cool place protected from moisture.
 - (2) Every precaution shall be taken to prevent accidental discharge of the gas, and protective equipment shall be readily available for use in an emergency.
 - (3) Only employees who have been properly trained and provided with the necessary protective equipment shall attempt to stop cylinder leaks.
 - (4) Should a chlorine leak develop, the cylinder shall be placed so that only "gas" escapes. (An ammonia swab may be used to detect leaks.) Water should not be sprayed or poured on chlorine leaks.
 - (5) Chlorine cylinders shall never be used or stored near flammable materials.

- (6) Dry chlorine shall be stored in an isolated area as mixing it with anything but water could cause a fire or explosion.
- v) See Section 304, Hazardous Materials, for additional information concerning hazardous compressed gases.
- w) For additional information concerning compressed gas requirements, refer to OSHA Standards 29 CFR 1910.101, 1910.253 and 1926.350.

NITROGEN

Principle Routes of Exposure

Inhalation - Simple asphyxiant. May cause suffocation by displacing the oxygen in the air. Exposure to oxygen-deficient atmosphere (<19.5%) may cause dizziness, drowsiness, nausea, vomiting, excess salivation, diminished mental alertness, loss of consciousness and death. Exposure to atmospheres containing 8-10% or less oxygen will bring about unconsciousness without warning and so quickly that the individuals cannot help or protect themselves. Lack of sufficient oxygen may cause serious injury or death.

Eyes & Skin - This product is a gas at room temperature. Contact with liquid may cause frostbite.

NITROGEN - HANDLING AND STORAGE

Handling - Use only in ventilated areas. Never attempt to lift a cylinder by its valve protection cap. Protect cylinders from physical damage; do not drag, roll, slide or drop. When moving cylinders, even for short distance, use a cart designed to transport cylinders. Use equipment rated for cylinder pressure. Use backflow preventive device in piping. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing leak to occur. Use an adjustable strap wrench to remove over-tight or rusted caps. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier.

Never put cylinders into trunks of cars or unventilated areas of passenger vehicles. Never attempt to refill a compressed gas cylinder without the owner's written consent. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit.

For additional recommendations consult Compressed Gas Association's (CGA) Safety Bulletin SB-2, Oxygen-Deficient Atmospheres. For additional handling recommendations, consult Compressed Gas Association's pamphlets P-1, G- 10.1, P-8.1, P-8.2, P-9, P-16, P-18, and Safety Bulletin SB-2.

Storage - Protect from physical damage. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Keep at temperatures below 52°C / 125°F. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers.

Transportation – Nitrogen Cylinders shall be transported in a secure manner and in the upright position with the valve cap in place.

304 Hazardous Materials

- a) Employees shall become knowledgeable in the use and handling of all chemicals including oils, greases, acids, solvents, aerosol products, paints, and any other product of this nature prior to using the product.
- b) Chemicals as mentioned above shall be disposed of using proper methods and in accordance with current regulations.
- c) To reduce the risks of working with hazardous materials, manufacturers of hazardous materials are required to convey hazard information to the users of their products. This is accomplished through the use of Material Safety Data Sheets (MSDS) and/or Safety Data Sheets (SDS) and container labeling. Employees shall refer to GVP's Hazard Communication Program for specific requirements for working with hazardous materials.
- d) Employees can obtain a list of hazardous materials known to be in their work area from MSDS on the GVP web site.
- e) The MSDS and/or 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 MSDS for all hazardous materials known to be in their work areas.
- f) MSDS and/or SDS shall be made available to contractors working on GVP 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 GVP'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.
- l) For additional information concerning the requirements for working with hazardous materials, refer to OSHA Standards 29 CFR 1910, Subpart Z, 29 CFR 1910.120 and 29 CFR 1926.65.

305 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.

306 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 (refer to Table 306-1).
- c) Proper ear protection may consist of any of the following: ear muffs, ear plugs, molded ear protectors, or wax type ear plugs. Plain cotton is not acceptable. Ear protective devices shall be worn properly to provide the required protection and kept clean to reduce the possibility of ear infection.
- d) For additional information concerning noise, refer to Section 404, Hearing Conservation, and OSHA Standard 29 CFR 1910.95.

Table 306-1. Permissible Noise Exposure (Source: OSHA Standard 29 CFR 1910.9 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.

308 Polychlorinated Biphenyls (PCBs)

- a) Only properly trained employees shall handle material containing PCBs.
- b) Employees shall wear full protective gear (goggles, coveralls, gloves, and boots) when cleaning up after a rupture of a capacitor or transformer containing PCBs. GVP employees should use PPE as noted in MSDS.

- c) Before entering a confined space (such as a transformer vault) after the failure of equipment containing PCBs, the space shall be purged by forced ventilation, and employees entering the space shall wear proper auxiliary breathing equipment until tests indicate the space is free of fumes.
- d) All materials such as rags, solvents, dirt, etc., contaminated by PCBs shall be disposed of according to GVP procedures and federal, state, and local regulations.

314 Use of Herbicides and Other Chemicals

- a) Before using any herbicide or other chemical, employees shall read the label carefully and follow the directions and precautions listed. (Refer to Section 304, Hazardous Materials, for additional information).
- b) Employees shall avoid skin contact with, or breathing mist of, spray material.
- c) Spray equipment shall be cleansed daily when using oil solutions.
- d) Spraying/application of herbicides, pesticides and/or other chemicals shall not be done during windy conditions.
- e) When spraying near power lines, employees shall maintain Minimum Approach Distance (MAD), including distance of spray from nozzle.
- f) 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.
- g) Oil and other liquids spilled on power spray equipment shall be removed as soon as possible to prevent falls from slippery surfaces.
- h) Walking and working surfaces of sprayers shall be covered with slip resistant material.
- i) Hose connections on hydraulic sprayers shall be checked before use to prevent rupture.
- j) Employees shall not smoke on or around mist-spray equipment when oil solutions are being mixed or used.
- k) Herbicides and other chemicals shall never be left where they would create a hazard to persons or property.
- l) Empty containers shall be disposed of in a safe manner. They shall never be thrown into ponds, lakes, or streams.
- m) Where applicable, all employees who apply pesticides or herbicides shall be licensed or work under the direct supervision of a licensed operator.
- n) Spray wastes shall be disposed of in a safe manner and in accordance with federal, state, and local regulations.
- o) Equipment upon which employees stand while the vehicle is in motion shall be equipped with guardrails around the working area.

PART 4 PERSONAL PROTECTIVE EQUIPMENT

PART 4 PERSONAL PROTECTIVE EQUIPMENT

401 Personal Protective Equipment (PPE)

a) All employees shall be equipped with the appropriate PPE necessary to safely perform their jobs. The employer shall ensure that a preliminary assessment of work operations is performed to adequately evaluate the hazards and select suitable PPE for the employees.

For additional information concerning personal protection equipment requirements, refer to OSHA Standard 29 CFR 1910.132; 1926.96; 1926.28; 1926.28, Subpart E.

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

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

See (Grand Valley Power ARC – Flash Table Pg 65.

402 Eye and Face Protection

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

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

b) Power grinding, buffing, or wire brushing.

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

d) Hand drilling or sawing of overhead objects.

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

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

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

h) Handling acids, caustics, chlorines, ammonia, or other similar liquids or gases, except when approved complete head coverings are worn (chemical goggles are necessary).

i) Brush chippers.

j) Thermite (cadweld) type welders.

k) Flying particles caused by other workers, if employee is within the range of such particles (a suitable screen around the work may be used instead).

l) Any other danger of injury to the eyes, or at the direction of a supervisor.

m) Any time there is a possibility of electrical flash, or work activities (as determined by a Job Hazard Analysis [JHA]) generate airborne particulates, appropriate protective shield or safety glasses shall be worn. If a worker may be exposed to an electrical hazard, all protective headwear, including prescription eyewear, must have an appropriate non-conductive rating. Refer to the most recent ANSI Z87.1 to determine appropriate eyewear and prescription eyewear. The employer shall ensure employees are equipped with non-metallic prescription eyewear.

n) While using powder-actuated tools.

o) Protective eyewear appropriate for the lighting condition shall be worn. Glasses with dark lenses shall not be worn in poor lighting conditions, before sunrise, or after sunset.

p) For additional information concerning eye and face protection requirements, refer to OSHA Standards 29 CFR 1910.133; 1926.95; 1926.102.

403 Head Protection

- a) Approved safety head gear shall be worn by all employees in areas where falling objects, electrical contact, or other hazards may cause a head injury, and when required by GVP policy. Refer to ANSI Z89.1 and manufacturer requirements to determine appropriate protection and replacement requirements for head gear.
- b) Safety head gear or head band assembly shall not be defaced or altered in any manner without approval.
- c) Approved head shields or hoods shall be worn when welding with hydrogen, Heli arc, or electric arc.
- d) All employees whose hair length (facial hair included) may cause a hazard when working around moving machinery or an external heat source sufficient to cause a fire, shall keep the hair to a safe length or wear a hair net or other device to keep the hair from causing hazards.
- e) For additional information concerning head protection requirements, refer to OSHA Standard 29 CFR 1910.135; 1926.100; ANSI Z89.1 for industrial workers, and ANSI Z89.2 for electrical workers.

404 Hearing Conservation

When exposed to noise of 90 dBA 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 TWA of 85 decibels. Company representatives will monitor the construction activity for noise levels, and any work activity producing noise above the action level shall be posted as a hearing protection required area and the proper hearing protection will be provided.

For additional information concerning hearing protection requirements, refer to Section 306, Noise, and OSHA Standards 29 CFR 1910.95, and 1910.95 App. B; 1926.101.

405 Wearing Apparel

The work uniform for the field is boots, long sleeved FR shirt, FR pants, safety glasses and hardhats. Shirt tails will be tucked into the pants, due to the following:

- Prevention of the shirt tail becoming entangled in a piece of equipment.
- Prevention of the “chimney effect”, whereby the heat energy of an arc flash/blast chimneys up under the un-tucked FR shirt, thus defeating the protection of the FR shirt.
- Exceptions to this rule, when work involving an excavation, trenching, using shovels and associated dirt work, the FR shirt need not be tucked in. This is done to help with heat stress and to eliminate dirt from coming down the inside of the shirt into the pants and the boots.
- Appropriate footwear required for special work shall be worn as directed by the employee in charge. All employees must wear appropriate footwear that will ensure minimum protection for assigned jobs. When protective footwear is required, it shall meet the requirements of OSHA Standard 29 CFR 1910.136; 1926.96. (Other protective devices are to be used in specific types of work to provide adequate personal protection.)

Also refer to clothing restrictions in Section 406, Clothing.

406 Clothing

- (a) ***Protection from flames and electric arcs. (GVP FR Clothing Policy to follow)***

(1) ***Hazard assessment.*** The employer shall assess the workplace to identify employees exposed to hazards from flames or from electric arcs.

(2) ***Estimate of available heat energy.*** For each employee exposed to hazards from electric arcs, the employer shall make a reasonable estimate of the incident heat energy to which the employee would be exposed.

Note 1 to paragraph (g) (2): Appendix E to this subpart provides guidance on estimating available heat energy. The Occupational Safety and Health Administration will deem employers following the guidance in Appendix E to this subpart to be in compliance with paragraph (g)(2) of this section. An employer may choose a method of calculating incident heat energy not included in Appendix E to this subpart if the chosen method reasonably predicts the incident energy to which the employee would be exposed.

Note 2 to paragraph (g) (2): This paragraph does not require the employer to estimate the incident heat energy exposure for every job task performed by each employee. The employer may make broad estimates that cover multiple system areas provided the employer uses reasonable assumptions about the energy-exposure distribution throughout the system and provided the estimates represent the maximum employee exposure for those areas. For example, the employer could estimate the heat energy just outside substation feeding a radial distribution system and use that estimate for all jobs performed on that radial system.

(3) ***Prohibited clothing.*** The employer shall ensure that each employee who is exposed to hazards from flames or electric arcs does not wear clothing that could melt onto his or her skin or that could ignite and continue to burn when exposed to flames or the heat energy estimated under paragraph (g)(2) of this section.

Note to paragraph (g)(3): This paragraph prohibits clothing made from acetate, nylon, polyester, rayon and polypropylene, either alone or in blends, unless the employer demonstrates that the fabric has been treated to withstand the conditions that may be encountered by the employee or that the employee wears the clothing in such a manner as to eliminate the hazard involved.

(4) ***Flame-resistant clothing.*** The employer shall ensure that the outer layer of clothing worn by an employee, except for clothing not required to be arc rated under paragraphs (g)(5)(i) through (g)(5)(v) of this section, is flame resistant under any of the following conditions:

(i) The employee is exposed to contact with energized circuit parts operating at more than 600 volts,

(ii) An electric arc could ignite flammable material in the work area that, in turn, could ignite the employee's clothing,

(iii) Molten metal or electric arcs from faulted conductors in the work area could ignite the employee's clothing, or

Note to paragraph (g)(4)(iii): This paragraph does not apply to conductors that are capable of carrying, without failure, the maximum available fault current for the time the circuit protective devices take to interrupt the fault.

(iv) The incident heat energy estimated under paragraph (g)(2) of this section exceeds 2.0 cal/cm².

(5) Arc rating. The employer 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 heat energy estimated under paragraph (g)(2) of this section whenever that estimate exceeds 2.0 cal/cm². This protective equipment shall cover the employee's entire body, except as follows:

(i) 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),

(ii) Arc-rated protection is not necessary for the employee's feet when the employee is wearing heavy-duty work shoes or boots,

(iii) Arc-rated protection is not necessary for the employee's head when the employee is wearing head protection meeting § 1926.100(b)(2) 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,

(iv) The protection for the employee's head may consist of head protection meeting § 1926.100(b)(2) 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, and

(v) 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.

Note to paragraph (g): See Appendix E to this subpart for further information on the selection of appropriate protection.

(6) Dates.

(i) The obligation in paragraph (g) (2) of this section for the employer to make reasonable estimates of incident energy commences January 1, 2015.

(ii) The obligation in paragraph (g) (4) (iv) of this section for the employer to ensure that the outer layer of clothing worn by an employee is flame-resistant when the estimated incident heat energy exceeds 2.0 cal/cm² commences April 1, 2015.

(iii) The obligation in paragraph (g) (5) of this section for the employer to ensure that each employee exposed to hazards from electric arcs wears the required arc-rated protective equipment commences April 1, 2015.

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

- a) All employees shall always wear clothing and shoes that are suitable for the particular type of work that they are doing and that are in compliance with GVP policy. The employer shall ensure that each employee who is exposed to the hazards of flames or electric arcs does not wear clothing that, when exposed to flames or electric arcs, could increase the extent of injury that would be sustained by the employee.
- b) GVP 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 calorie per centimeter (cal/cm²) exists, GVP shall estimate arc exposure values based on their own fault current and work practice separation distance from the arc to the employee. Grand Valley Power shall use 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 (Reference Grand Valley Power Arc-Flash Energy Hazards Table below).
- c) The wearing of short pants when performing any type of electrical line work shall be prohibited.

Grand Valley Power Arc-Flash Energy Hazards

Equipment Type	Nominal Voltage Range and Arc Energy (cal/cm ²)					
	0V - 240V ^①	277V - 480V ^①	7,200V / 12,470V	14,400 / 24,900V	69kV	230kV
Open air (includes lines)	4 ^②	8 ^③	8 ^③	8 ^③	4 ^③	N/A
Distribution Substation Bus	N/A	N/A	See Table ^④	See Table ^④	De-energize	De-energize
Pad-mounted transformers	4 ^③	4 ^③	4 ^③	8 ^③	N/A	N/A
Self-contained meters / cabinets	4 ^③	20 ^⑤	N/A	N/A	N/A	N/A
CT Meters and control wiring	4 ^③	4 ^③	N/A	N/A	N/A	N/A
Pedestals / pull boxes / hand holes	4 ^③	20 ^⑤	N/A	N/A	N/A	N/A
Panel boards (single phase)	4 ^③	8 ^③	N/A	N/A	N/A	N/A
Panel boards (three phase)	4 ^③	De-energize ^⑥	N/A	N/A	N/A	N/A

① Values for equipment energized at 0-480V derived from NESC Table 410-1

② Industry 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 (2017 NESC Table 410-1)

③ Industry testing 480 V equipment indicates exposure on pad-mounted transformers do not exceed 4 cal/cm² (2017 NESC Table 410-1)

④ Incident analysis on this equipment indicates exposures do not exceed the values in the table (2017 NESC Table 410-1)

⑤ Industry testing 480 V equipment indicates exposure on self contained meters do not exceed 20 cal/cm² (2017 NESC Table 410-1)

⑥ Industry testing 480 V panels with non-edge mounted bus bars indicates exposures do not exceed 8 cal/cm² (2017 NESC Table 410-1)

⑦ Industry testing 480 V panels with edge mounted, parallel bus bars indicate arcs will not self-extinguish and heat flux rates will exceed 60 cal/cm²... Perform arc hazard analysis. (2017 NESC Table 410-1)

⑧ Values for equipment energized at 7.2/12.5 kV calculated using formulas from IEEE Std. 1584.

⑨ Values for equipment energized at voltages above 15 kV calculated using ARCP software.

Substation Distribution Bus Arc Energy

Substation Bus	Arc Energy (cal/cm ²)
Adobe 12.5kV	43.8
Bookcliff 12.5kV	15.2
Fruita 12.5kV	12.4
Fruita 24.9kV	4.2
Highline 12.5kV	15.5
Loma 12.5kV	5.2
Molina 12.5kV	8.0
Orchard Mesa 12.5kV	15.0
Orchard Mesa 24.9kV	8.5

Notes:

Values applicable on source side of circuit reclosers

Upstream protective device is transformer protection

12.5kV calculated with IEEE 1584 calculations

24.9kV calculated with ARCPRO

Working distance = 15 in

Gap distance = 2 in (12.5kV), 4 in (24.9kV)

GVP 7.2/12.47 kV Substation Buses, Switchgear & Padmounts

Bus Information	Bolted Fault Current	Total Arcing Fault	Gap Dist	Working Distance	Arc Clearing Time	Incident Energy
Name of Location	kA	kA	mm	mm	sec	cal/cm ²
Adobe Sub 12kV Bus	10.55	10.23	153	381	0.36	10.5
Bookcliff Sub 12kV Bus	3.53	3.49	153	381	1.55	14.0
Fruita Sub 12kV Bus	3.86	3.81	153	381	1.28	12.8
Highline Sub 12kV Bus	3.67	3.63	153	381	1.43	13.5
Loma Sub 12kV Bus	2.19	2.18	153	381	0.87	4.8
Molina Sub 12kV Bus	2.74	2.71	153	381	1.00	6.9
Orchard Mesa Sub 12kV Bus	3.90	3.85	153	381	1.26	12.7
Adobe 12kV Bus 85%	8.97	8.72	153	381	0.39	9.6
Bookcliff 12kV Bus 85%	3.00	2.97	153	381	2.22	16.9
Fruita 12kV Bus 85%	3.28	3.24	153	381	1.81	15.2
Highline 12kV Bus 85%	3.12	3.09	153	381	2.03	16.1
Loma 12kV Bus 85%	1.86	1.86	153	381	1.19	5.5
Molina 12kV Bus 85%	2.33	2.31	153	381	1.36	7.9
Orchard Mesa 12kV Bus 85%	3.32	3.28	153	381	1.77	15.0
Adobe 12kV Switchgear	10.55	10.23	153	455	0.06	1.5
Bookcliff 12kV Switchgear	3.53	3.49	153	455	0.18	1.5
Fruita 12kV Switchgear	3.86	3.81	153	455	0.05	0.5
Highline 12kV Switchgear	3.67	3.63	153	455	0.05	0.4
Loma Sub 12kV Switchgear	2.19	2.18	153	455	0.13	0.7
Molina Sub 12kV Switchgear	2.74	2.71	153	455	0.03	0.2
Orchard Mesa 12kV Switchgear	3.90	3.85	153	455	0.05	0.5
Wagner Equip Switchgear	2.97	2.95	153	455	0.03	0.2
Wagner Equip Cable Elbows	2.97	2.95	13	455	0.03	0.1
Poma Switchgear	1.56	1.56	153	455	0.06	0.2
Poma Cable Elbows	1.56	1.56	13	455	0.06	0.1
U1/0/1 Open Air	9.35	9.08	153	381	0.07	1.8
U1/0/1 Switchgear	9.35	9.08	153	455	0.07	1.6
U1/0/78 Open Air	1.12	1.13	153	381	0.89	2.4
U1/0/78 Switchgear	1.12	1.13	153	455	0.89	2.1
*Note: U-1 circuit calculated with new breaker settings						

- 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.
- e) Finger rings or unnecessary jewelry shall not be worn while employees climb on or off structures or vehicles or while performing any task where the ring might be caught under or snagged by a projecting item. Rings and wrist watches with metal case and watch bands shall not be worn while working on or near energized equipment or lines. Medical alert bracelets may be worn with transparent bands that hold the bracelets snugly to the skin.
- f) 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.
- g) Due to the potential for heat-related illness when wearing protective clothing in ambient temperatures greater than 78° F, employers shall provide employees additional awareness training regarding the recognition and prevention of signs and symptoms of heat-related illness. (Refer to the American Conference of Governmental Industrial Hygienists 2012 *Threshold Limit Values and Biological Exposure Indices*.)
- h) Employees shall refer to GVP policies for additional clothing requirements, including manufacturer recommendations for use and care.

APPA strongly recommends consulting the 2012 National Electrical Safety Code requirements for additional information on clothing and arc-flash protection systems.

407 Use and Care of Rubber Gloves

Note: GVP rules may require the use of rubber sleeves in addition to rubber gloves

- a) The use of rubber gloves shall be in accordance with Table I - 4.

TABLE I-4—RUBBER INSULATING EQUIPMENT, VOLTAGE REQUIREMENTS

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.

b) Voltage shall be considered to be phase-to-phase voltage unless all conductors except the one being worked are insulated (with protective devices) or isolated so that physical contact cannot be made with any energized part. In that case, phase-to-ground voltage will determine maximum-use voltage.

(a) If work to be performed is on a single phase energized line, 14.4 to ground, 20kv gloves will be allowed.

(b) If work to be performed is on a multi-phase structure and exposure is greater than 14.4 to 24.9 voltage, 30 kv gloves are required.

c) Employees shall wear rubber gloves while working on any pole or other structure on which energized lines or equipment are located, or that are located close to energized lines or equipment where an employee could make contact (see Section 507.1, Working on or Near Exposed Energized Lines and Equipment, for limits on voltages 5 kV or more). **When employees are gloving, the rubber gloves shall be put on (after all obstructions have been cleared), and also while operating an aerial device. The required distance for the employee use of rubber gloves is to be within 10 feet of any piece of energized equipment or lines (including the system neutral). Furthermore, employees shall not remove the gloves until they have descended the pole or structure or positioned the aerial device to exceed the 10 foot requirement.** (Exception: 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. Glove(s) may be momentarily removed as described in the following conditions: Condition 1) Momentary removal of one glove to retrieve small items from down within the bucket and/or from a ditty bag is acceptable; Condition 2) Momentary removal of both gloves is acceptable only after backing out of the live-line work zone, outside of extended reach minimum 10 feet.)

Note: Section 407 c) is intended for work practices that use rubber gloves for primary protection.

d) When an employee uses rubber insulating gloves or rubber insulating gloves and sleeves as insulation from energized parts (under paragraph (c)(1)(iii)(A) of this section), the employer shall ensure that the employee:

1) Puts on the rubber insulating gloves and sleeves in a position where he or she cannot reach into the minimum approach distance, established by the employer under paragraph (c)(1) of this section; and

2) Does not remove the rubber insulating gloves and sleeves until he or she is in a position where he or she cannot reach into the minimum approach distance, established by the employer under paragraph (c)(1) of this section.

e) When using live-line tools, 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 as indicated in Grand Valley Power Table – Page 97) 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. Employees shall refer to REC policy regarding additional rubber glove requirements.

Note: Section 407 d) is intended for work practices that use tested insulated live-line tools as primary protection.

- f) In addition, rubber gloves shall be worn during the following conditions:
- (1) Working on or within falling or reaching distance of conductors, electrical equipment, or metal surface (crossarms, crossarm braces, or transformer cases), which are not effectively grounded and which may be or may become energized.
 - (2) During wet or stormy weather, working on or within falling or reaching distance of any conductor or equipment that may be or may become energized at any voltage.
 - (3) Required by supervision.
 - (4) Removing lead sheath and sleeves from cables and joints and opening or cutting cables (until they have been proven to be de-energized at the work location by positive tests) and grounded.
 - (5) Performing tests on cables using approved testing devices.
 - (6) Operating manually controlled air-break switches.
 - (7) Opening and closing manually operated oil circuit breakers.
 - (8) Using approved switch sticks or live-line tools for opening, closing, removing, or replacing hot clamps, fuses, or fuse doors on cutouts or when making or breaking any circuit and during inclement weather. (Exception: gloves need not be worn when using an extendo stick from the ground at a minimum of 20 feet that has been tested per manufacturer's recommendation.)
 - (9) Using approved switch sticks or live-line tools for making tests to determine if lines are de-energized, in applying and removing grounding devices, and during inclement weather.
 - (10) Working on or near series street lighting circuits even though they are disconnected from the source of power.
 - (11) Repairing series fixtures or attachments, the circuit of which is exposed to energized conductors, except where the fixtures are disconnected from the line.
 - (12) Pulling in wires or handling other conducting materials near circuits, apparatus, or equipment that is or may become energized.
 - (13) Working on or near telephone or other circuits that are subject to induced voltages from energized high voltage circuits, unless such circuits to be worked are adequately grounded.
 - (14) Making physical contact with protective devices installed on energized conductors. While setting or removing poles between or near conductors energized above 600 volts, observe the following:
 - (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.
 - (15) **Rubber gloves shall be worn while repairing or splicing the system common neutral.**
 - (16) For Voltages 600 volts and below, Class 0 gloves shall be worn.

(17) Refer to Section 509.9, Rubber Glove Use, and OSHA Standard 29 CFR 1910.137 for additional rubber glove requirements.

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

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.

h) Leather protectors or overgloves shall not be worn except over rubber gloves. Their use shall conform to OSHA Table i-4 Rubber Insulated Equipment Voltage Requirements

TABLE I-1—AC PROOF-TEST REQUIREMENTS

Class of Equipment	Proof-test Voltage rms V	Maximum proof-test current, mA (gloves only)			
		280-mm (11-in) glove	360-mm (14-in) glove	410-mm (16-in) glove	460-mm (18-in) glove
00	2,500	8	12		
0	5,000	8	12	14	16
1	10,000		14	16	18
2	20,000		16	18	20
3	30,000		18	20	22
4	40,000			22	24

TABLE I-2—DC PROOF-TEST REQUIREMENTS

Class of equipment	Proof-test voltage
00	10,000
0	20,000
1	40,000
2	50,000
3	60,000

TABLE I-2—DC PROOF-TEST REQUIREMENTS—Continued

Class of equipment	Proof-test voltage
4	70,000

Note: The dc voltages listed in this table are not appropriate for proof testing rubber insulating line hose or covers. For this equipment, dc proof tests shall use a voltage high enough to indicate that the equipment can be safely used at the voltages listed in Table I-4. See ASTM D1050-05 (2011) and ASTM D1049-98 (2010) for further information on proof tests for rubber insulating line hose and covers, respectively.

TABLE I-3—GLOVE TESTS—WATER LEVEL ^{1 2}

Class of glove	AC proof test		DC proof test	
	mm	in	mm	in
00	38	1.5	38	1.5
0	38	1.5	38	1.5
1	38	1.5	51	2.0
2	64	2.5	76	3.0
3	89	3.5	102	4.0
4	127	5.0	153	6.0

¹ The water level is given as the clearance from the reinforced edge of the glove to the water line, with a tolerance of ±13 mm. (±0.5 in.).

² If atmospheric conditions make the specified clearances impractical, the clearances may be increased by a maximum of 25 mm. (1 in.).

TABLE I-4—RUBBER INSULATING EQUIPMENT, VOLTAGE REQUIREMENTS

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.

- 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. Insulating equipment shall be inspected for damage before each day's use and immediately following any incident that can reasonably be suspected of causing damage. Insulating gloves shall be given an air test, along with the inspection.
- 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 outlined in g) above, rubber gloves shall be periodically tested according to Table 507-7.
- n) Refer to Section 509.9, Rubber Glove Use, and OSHA Standard 29 CFR 1910.137 for additional rubber glove requirements.

408 Supplemental Breathing Equipment

- a) Approved breathing apparatus shall be used for the following:
 - (1) Entering or working in any confined or enclosed space or in any environment where an adequate supply of fresh air cannot be assured.
 - (2) Sandblasting.
 - (3) Exposure to any environmental condition that would be unhealthy.
- b) Supplemental breathing equipment shall not be used unless the employee has been trained in its use, and it has been determined that the employee is physically able to perform the work and use the equipment.

410 Respirators

Note: *In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials).*

- a) A sufficient number of respirator models and sizes shall be available so that the respirator is acceptable to, and correctly fits, the user:
- (1) Respirators for Immediately Dangerous to Life and Health (IDLH) Atmospheres: For IDLH atmospheres, one of the following respirators must be provided and used in accordance with manufacturer's instructions:
 - A full facepiece, pressure demand, self-contained breathing apparatus (SCBA) with a minimum service life of 30 minutes.
 - A combination full facepiece, pressure demand, supplied-air respirator (SAR) with auxiliary self-contained air supply.
 - Respirators provided only for escape from IDLH atmospheres shall be certified for escape from the atmosphere in which they will be used.
 - All oxygen deficient atmospheres shall be considered IDLH.
 - (2) Respirators for Non-IDLH Atmospheres: Respirators shall be provided that are adequate to protect the health of the employee under routine and reasonably foreseeable emergency situations. The respirator selected shall be appropriate for the chemical state and physical form of the contaminant. For protection against gases and vapors, one of the following respirators shall be provided:
 - Atmosphere-supplying respirator (ASR).
 - Air-purifying respirator (APR).
 - (3) Air-purifying respirators against gases and vapors are permitted only when:
 - The respirator is equipped with an end-of-service-life indicator (ESLI) certified for the contaminant, or
 - If there is no appropriate ESLI, a change schedule for canisters and cartridges, based on objective information or data that will ensure that canisters and cartridges are changed before the end of their service life, shall be implemented.
 - (4) For protection against particulates, one of the following respirators shall be provided:
 - Atmosphere-supplying respirator.
 - Air-purifying respirator equipped with a filter certified as a high efficiency particulate air (HEPA) filter, or an air-purifying respirator equipped with a filter certified for particulates.
 - For contaminants consisting primarily of particles with mass median aerodynamic diameter (MMAD) of at least 2 micrometers (approximately 8×10^{-6} inch or ASTM Standard Sieve No. 5000), an air-purifying respirator equipped with any filter certified for particulates by National Institute for Occupational Safety and Health (NIOSH).
- b) Only employees who have been properly trained, fit tested, and determined physically able to perform the work and wear the respirator shall be assigned a task that requires the use of a respirator.
- c) When respirators are provided for a particular work activity, they shall be used.
- d) Use of a respirator shall follow the manufacturer's instructions.
- e) Persons using air line respirators, self-contained breathing apparatus, or similar respirator devices in IDLH environments shall be equipped with a safety harness and lifeline or other equivalent means of rescue. At least one person with suitable self-contained breathing apparatus shall be at the nearest fresh-air base for emergency rescue.

- f) Approved respirators shall be worn when:
 - (1) Applying paint or toxic liquids with pressure spray equipment inside buildings, except in shops where special approved rooms or booths are provided for this purpose.
 - (2) Buffing that creates an abnormal amount of dust.
 - (3) Welding or cutting involving hazardous materials without adequate ventilation.
 - (4) Handling lime or other toxic or caustic powdered chemicals.
 - (5) Exposed to abnormal amounts of coal dust.
 - (6) Sandblasting.
 - (7) Handling acids or caustics.
 - (8) Handling asbestos.
 - (9) Exposed to nuisance dusts.
 - (10) Handling fly or bottom ash.
 - (11) Exposed to known radiation hazards.
 - (12) Entering or working in areas of unknown air quality.
 - (13) Required by GVP's Respiratory Protection Program or supervision.
- g) All respirators shall be cleaned after use and stored in sanitary containers. Records of a Respirator Maintenance Program shall be kept.
- h) The employer shall not permit respirators with tight-fitting facepieces to be worn by employees who have the following:
 - (1) Facial hair that comes between the sealing surface of the facepiece and the face or that interferes with valve function, or
 - (2) Any condition that interferes with the face-to-facepiece seal or valve function.

If an employee wears corrective glasses or goggles or other PPE, the employer shall ensure that such equipment is worn in a manner that does not interfere with the seal of the facepiece of the user.

PART 5 GENERAL FACILITY OPERATIONS

PART 5 GENERAL FACILITY OPERATIONS

501 Office Safety

501.1 General Office Safety

- a) Employees shall report all injuries, regardless of severity, to the person in charge.
- b) Employees shall walk cautiously up and down stairs. The handrail shall be used whenever possible.
- c) Caution shall be exercised when walking around blind corners.
- d) Drawers of desks and file cabinets shall be kept closed when not in use.
- e) Only one drawer of a file cabinet shall be pulled out at a time in order to avoid tipping, unless the cabinet is securely fastened to the wall or to other cabinets.
- f) Do not sit on the edge of a chair. Do not tilt back when sitting in a straight chair.
- g) Boxes, chairs, etc., shall not be used in place of ladders.
- h) The floor shall be kept free of tripping hazards such as telephone cords, electric extension cords, and paper cartons.
- i) Employees mopping or waxing floors shall place warning signs to alert co-workers of the potential for slippery floors. All liquid spills shall be immediately cleaned up.
- j) Material shall be stored on shelves in a manner to prevent falling; heavy objects shall be placed on lower shelves.
- k) Hallways and aisles shall be kept clear of all obstructions.
- l) All emergency exits and emergency equipment such as fire extinguishers and fire hose racks shall be kept clear of all obstructions.
- m) Employees shall not use ventilation fans unless they are guarded or securely placed at least 7 feet above the floor.
- n) Solvents and other volatile or toxic substances shall be used only with adequate personal protection or in well-ventilated areas. Refer to Section 304, Hazardous Materials.
- o) Employees shall not attempt to clean, oil, or adjust any machine that is running. If the machine is not equipped with a starting switch that can be locked in the "off" position, it shall be disconnected from its power source.
- p) Unsafe electrical cords, faulty electrical or other equipment, or any other hazardous condition shall be reported.
- q) Safety shall be considered in what employees wear on the job. Loose-fitting clothing, dangling bracelets, rings, and ties may cause serious injury to employees operating or working around power-driven machines and shall not be worn.
- r) Broken glass and other sharp objects shall not be placed in wastepaper containers unless properly protected and/or sealed.
- s) Cigarettes, cigars, and other burning materials shall not be placed in wastepaper containers.
- t) Common or sharp-pointed pins shall not be used for fastening paper together. Staples, paper clips, or other approved fasteners shall be used.

501.2 Video Display Terminals

- a) Employees using video display terminals for extended periods of time shall consider the following:

- (1) Keep back straight with feet resting firmly on the ground.
 - (2) Use a back-support cushion for lower back.
 - (3) Position video display terminal so the operator's eyes are level with the top of the screen.
 - (4) Position the video display terminal directly in front of the user and adjust to avoid glare.
 - (5) Adjust the height of the chair or keyboard so that shoulder-elbow-arm angle is 90 degrees.
 - (6) Use a cushioned wrist rest to keep user's hands and fingers in the same plane as the forearm.
- b) Video display terminal users shall adjust position frequently to avoid muscle stiffness.

502 Warehouse Operations

502.1 General

- a) Warehouse materials shall be stored in a manner that will prevent shifting or falling.
- b) Unstable materials must be secured to prevent shifting, falling, or rolling.
- c) Stored materials shall not be allowed to protrude in or obstruct aisles.
- d) When stacking materials, consideration shall be given to the size of the material for stability of the stack.
- e) Materials shall not be stored too close to overhead or wall mounted appliances such as lights, heaters, fire protection equipment, electrical panels, and similar devices.
- f) 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.
- h) For additional information, refer to Section 110 Housekeeping, Section 301, Material Handling and Storage, Section 503, Vehicle Operations, and Section 503.9, Industrial Trucks--Fork Lifts.

502.2 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 GVP 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.
- h) For additional information, refer to Section 304, Hazardous Materials.

503 Vehicle Operations

503.1 General

- a) Only specifically authorized employees who possess a valid license or permit for the equipment being used shall operate GVP-owned motor vehicles or personally owned vehicles on GVP business. All vehicle loading and operation shall be done according to applicable state and federal Department of Transportation rules and regulations.
- b) Drivers shall know and obey all state and local motor vehicle laws applicable to the operation of their vehicle.
- c) The driver shall drive at safe speeds no greater than that permitted by law. Traffic, road, and weather conditions shall be given consideration in determining the safe speed within the legal limit at which the vehicle shall be operated.
- d) A driver shall not permit unauthorized persons to drive or operate an GVP vehicle.
- e) Passengers in GVP vehicles will be allowed only as specified by GVP.
- f) If seat belts are provided, they shall be used by all occupants.
- g) Employees shall not permit anyone to ride on the running boards, fenders, or any part of the vehicle except on the seats or inside the body walls. Passengers shall not stand in moving vehicles.
- h) Employees shall not ride on trailers.
- i) Employees shall not jump on or off vehicles in motion.
- j) All vehicles shall be equipped with the appropriate safety and emergency equipment, such as fire extinguisher, first aid kit, traffic cones, signs, flares, and reflectors.
- k) Refer to Section 504, Vehicle Maintenance, for vehicle maintenance operations.
- l) Employees shall refer to GVP policies for additional requirements.
- m) For additional information regarding vehicle operation, refer to OSHA Standard 29 CFR 1926.601.
- n) For additional information regarding vehicle loading and operation, refer to Department of Transportation, Section 402 of Title 23.

503.2 Inspection of Equipment

- a) The driver shall preform pre-trip and document post trip.
Driver is to determined that brakes are in a safe operating condition before operating equipment. If brakes are not working properly, they must be corrected before vehicle is used.
- b) The driver shall inspect windshield wipers frequently and see that they are in good operating condition and that the windows and windshield give sufficient visibility for safe operation of vehicle.
- c) All vehicle lights and reflectors shall be inspected by the employee; if found defective, they shall be repaired immediately.
- d) The driver shall report any defects that may have developed during the day. If the brakes are not working properly, they shall be adjusted or repaired before the vehicle is put into operation. Other items that affect safety shall be repaired prior to continued vehicle operation.

503.3 Exhaust Gas

The driver shall not operate the engine in any garage except when driving in or out, and then the engine shall be operated as little as practicable. The engine shall not be warmed up inside a garage

nor shall the driver test the engine operation in a garage unless the exhaust gas is carried directly to outside atmosphere, or doors and windows are open so that adequate ventilation exists.

503.4 Operation

- a) The operator of a motor vehicle shall clearly signal intention of turning, passing, or stopping.
- b) Upon a signal from a vehicle approaching from the rear, the driver of an GVP 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) For information on basic guidelines for the use of wireless electronic devices, including while operating vehicles, refer to Section 113, Wireless Electronic Devices.

503.5 Parking

- a) When vehicles must be parked on the roadway, they shall be parked facing in the direction of traffic flow, whenever possible.
- b) When parking on a roadway, vehicles shall park off the traveled road surface, whenever possible. When vehicles must park closer than 10 feet to the traveled road surface, appropriate warning devices shall be used.
- c) Trucks or trailers stopped on any public roadway shall be protected by proper warning lights, reflectors, or red flags in accordance with state or local requirements.
- d) Vehicles shall not be parked on bridges or over culverts except when necessary for work.
- e) When it is necessary to park on an incline, the driver shall make sure the vehicle is left in a safe position. The engine shall be turned off, the vehicle placed in the lowest gear or “park” position, and the parking brake set. The front wheels shall be cut into the curb, or if a curb is not present, the rear wheels shall be chocked.

- f) Refer to all local, state, and federal standards.

503.6 Backing

- a) Whenever possible, the vehicle shall be positioned to avoid the necessity of backing.
- b) Extreme caution shall be exercised when backing a vehicle, to avoid injury to persons and to prevent property damage. Another employee, if present, shall be stationed at the rear of the vehicle to assist the driver in backing the vehicle safely.
- c) When backing a vehicle which has an obstructed view to the rear, take the following precautions:
 - (1) A reverse signal (backup alarm) audible above the surrounding noise level shall be used, or
 - (2) An observer shall signal that it is safe to back.
 - (3) Back slowly.
 - (4) Watch both sides but do not depend entirely on mirrors.
 - (5) In any difficult backing situation, enlist the help of another person on the ground as a guide, when such help is available.

503.7 Stopping on the Highway

- a) Stopping on the highway shall be avoided.
- b) When it is absolutely necessary to stop on the highway, use extreme caution. Warning signals and lights shall be used 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*.

503.8 Hauling Poles or Ladders

- a) Poles, ladders, pipe, etc., shall be loaded parallel with the truck length. Such material shall not extend beyond the normal sides of the vehicle.
- b) Materials shall be securely fastened to prevent a hazard due to shifting.
- c) Material that extends more than 4 feet beyond the front or back of the truck or trailer shall have warning devices attached. During the day, red flags shall be used; at night and during periods of poor visibility, red lights or an escort vehicle with strobe lights shall be used. An employee shall be used for flagging when necessary.
- d) When a vehicle hauling long poles must enter congested areas or heavy traffic, escort vehicles displaying suitable warning signs should be used.
- e) Refer to Sections 507.15, Pole Storage-Temporary, and 507.16, Setting and Removing Poles, for additional pole handling requirements.

503.9 Industrial Trucks--Fork Lifts

- a) Industrial trucks shall be operated only by authorized persons who are qualified and trained in their use.

- b) Brakes and controls shall be tested before use. Equipment with faulty brakes or mechanical or electrical defects shall not be operated. Needed repairs shall be completed or reported immediately.
- c) Equipment shall always be operated at a safe speed for existing conditions.
- d) Before moving the equipment, the operator shall make sure that no person or objects are in the path of the vehicle. Clearances in all directions shall always be checked, particularly overhead clearances.
- e) Industrial trucks shall not be fueled with the engine running.
- f) When picking up a load, forks shall be set squarely and as far as possible under the load. Loads should not be raised or lowered while traveling. Loaded or empty, forks should be carried as low as possible, but high enough to clear uneven surfaces.
- g) Loads shall not be suspended or swung over other persons. No one should be allowed to stand, walk or work under elevated forks.
- h) The operator shall always face in the direction of travel.
- i) On inclines, all types of loaded lift trucks shall be driven with the load on the upgrade side of the driver, whether ascending or descending.
- j) Sudden stops, which might spill the load, shall be avoided.
- k) All loads shall be securely fastened or safely positioned to prevent tipping or falling.
- l) Lift bars on fork lift trucks that are movable or replaceable shall be held firmly in place by a proper securing pin. Jury-rigged devices, such as using a threaded bolt, shall not be permitted.
- m) Only attachments provided by or approved by the manufacturer may be used. Such attachments shall be properly secured. Improvised methods shall not be used.
- n) No one shall be allowed to ride the truck, fork lift, or other equipment other than the operator, except when seats are provided for this purpose.
- o) When an industrial truck is left unattended (operator is 25 feet away or the vehicle is not in his view), the load engaging means shall be fully lowered, controls shall be neutralized, power shall be shut off, and brakes set. Wheels shall be chocked when the truck is parked on an incline.
- p) Equipment with internal combustion engines shall not be operated in enclosed areas for prolonged periods of time so as not to exceed the allowable levels of carbon monoxide.
- q) When trucks or railroad cars are loaded or unloaded, approved dockboards that are properly secured shall be used. The wheels of the truck or railroad car shall be blocked.
- r) For additional information concerning industrial trucks, refer to OSHA Standard 29 CFR 1910.178.

503.10 Cranes, Derricks, Hoisting Equipment

- a) Only authorized persons shall be permitted in the cab or on the equipment. Only those designated persons who are trained and qualified shall operate the hoisting equipment.
- b) Crane operators shall be certified where required. See OSHA 29 CFR 1926.1427 and 1926.550 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.
- f) The following are the minimum checks which shall be made daily before use:

- (1) All control mechanisms for maladjustment interfering with proper operation.
 - (2) All safety devices for malfunction.
 - (3) Deterioration or leakage in air or hydraulic systems.
 - (4) Hooks, hoist lines, slings, and load attachment devices.
 - (5) Fire extinguisher available (5 BC or larger).
- g) 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.
- h) 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 1925.251.
- i) For the first lift of each day, the load shall be test lifted and the brakes checked (load lifted several inches, then tested).
- j) With every load, the slings and bindings shall be checked and shall be readjusted as necessary to ensure safety and stability.
- k) Signals to the equipment operator shall be given by one person designated to perform this task. The signal person shall be properly qualified. The operator shall, however, obey a "Stop" signal given by anyone. Refer to Figure 503-1 for standard crane hoist hand signals.

Figure 503-1. Crane Hoist Hand Signals

 Main Hoist	 Auxiliary Hoist	 Hoist Load	 Hoist Load Slowly	 Stop
 Raise Boom	 Raise Boom & Lower Load	 Lower Load	 Lower Load Slowly	 Emergency Stop
 Lower Boom	 Lower Boom & Raise Load	 Swing Boom	 Swing Boom Slowly	 Travel (mobile eqpt)
 Retract Boom 2 hands	 Retract Boom 1 hand	 Extend Boom 2 hands	 Extend Boom 1 hand	 Dog Everything

- l) 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.
- m) 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.
- n) Winch lines, ropes, or wire cables shall not be guided by hand when standing within reach of the drum or sheave.
- o) 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.

- p) 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 503-2. The U-bolt shall be applied so that the U section is in contact with the dead end of the rope.
- q) Operators shall not leave their position at the controls of cranes, hoists, derricks, or other lifting devices while the load is suspended.
- r) Operators of cranes, derrick, hoists, and other hoisting equipment shall exercise extreme caution when in proximity to energized lines or equipment:
- (1) When performing power transmission or distribution construction, refer to Section 507, Overhead Distribution and Transmission, for applicable clearance requirements.
 - (2) When work does not involve power transmission or distribution construction and maintenance, minimum clearance distances shall be the following (numbers are expressed as phase-to-ground voltages):
- Up to 50 kV: 10 feet.
 - Over 50 kV: 10 feet plus 0.4 inch for each 1 kV over 50 kV.
- s) 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.
- t) For additional information concerning cranes, derricks, and hoisting equipment, refer to OSHA Standards 29 CFR 1910.180 and 29 CFR 1910.181.



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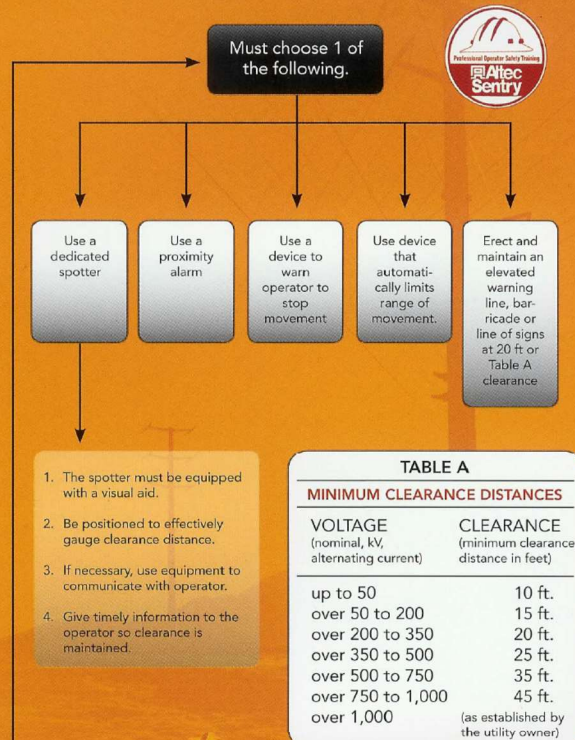
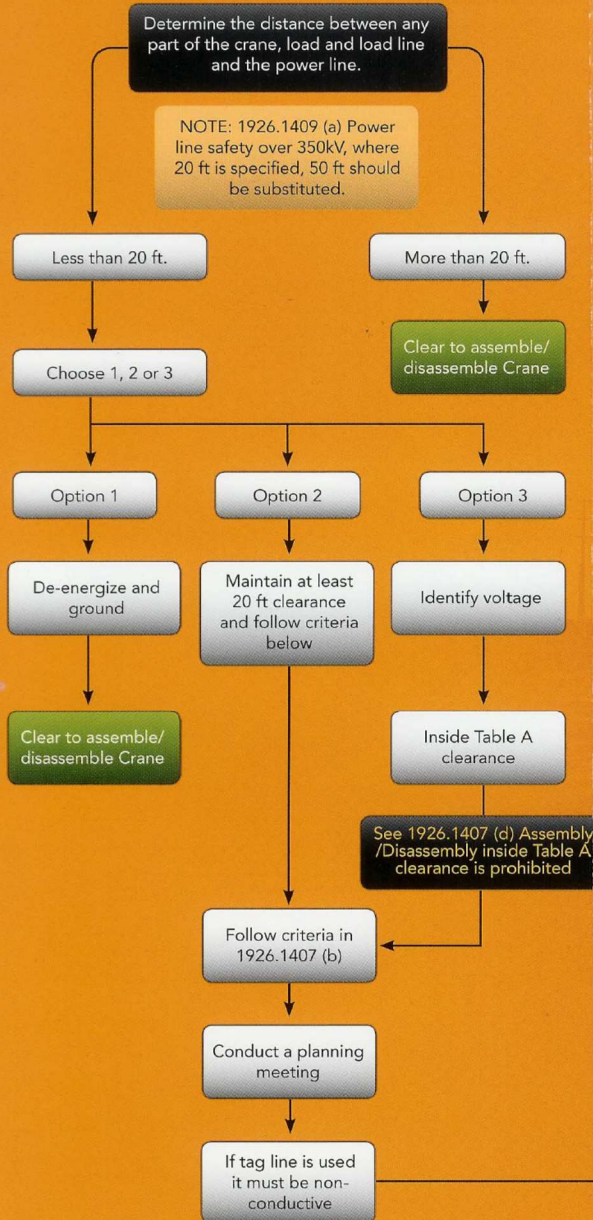
CRANE ASSEMBLY & DISASSEMBLY AROUND POWER LINES FLOWCHART

29 CFR 1926.1407

This flowchart can help employees comply with OSHA's requirements in 29 CFR 1926.1407 for assembly and disassembly of cranes around power lines. For more information refer to the OSHA standard.

CRANE ASSEMBLY/DISASSEMBLY AROUND POWER LINES FLOWCHART

29 CFR 1926.1407





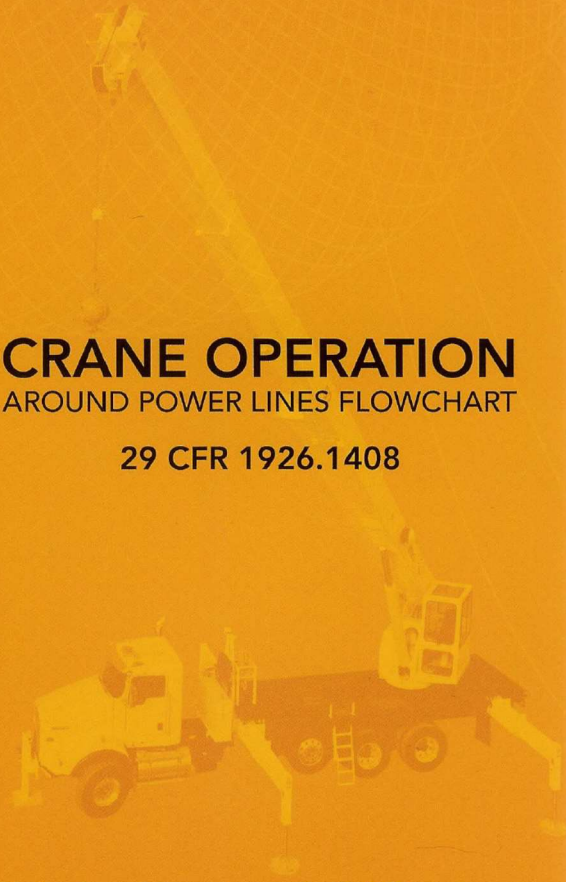
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CRANE OPERATION AROUND POWER LINES FLOWCHART

29 CFR 1926.1408



This flowchart can help employer comply with OSHA's requirements in 29 CFR 1926.1408 for crane operation around power lines. For more information, refer to the OSHA standard.

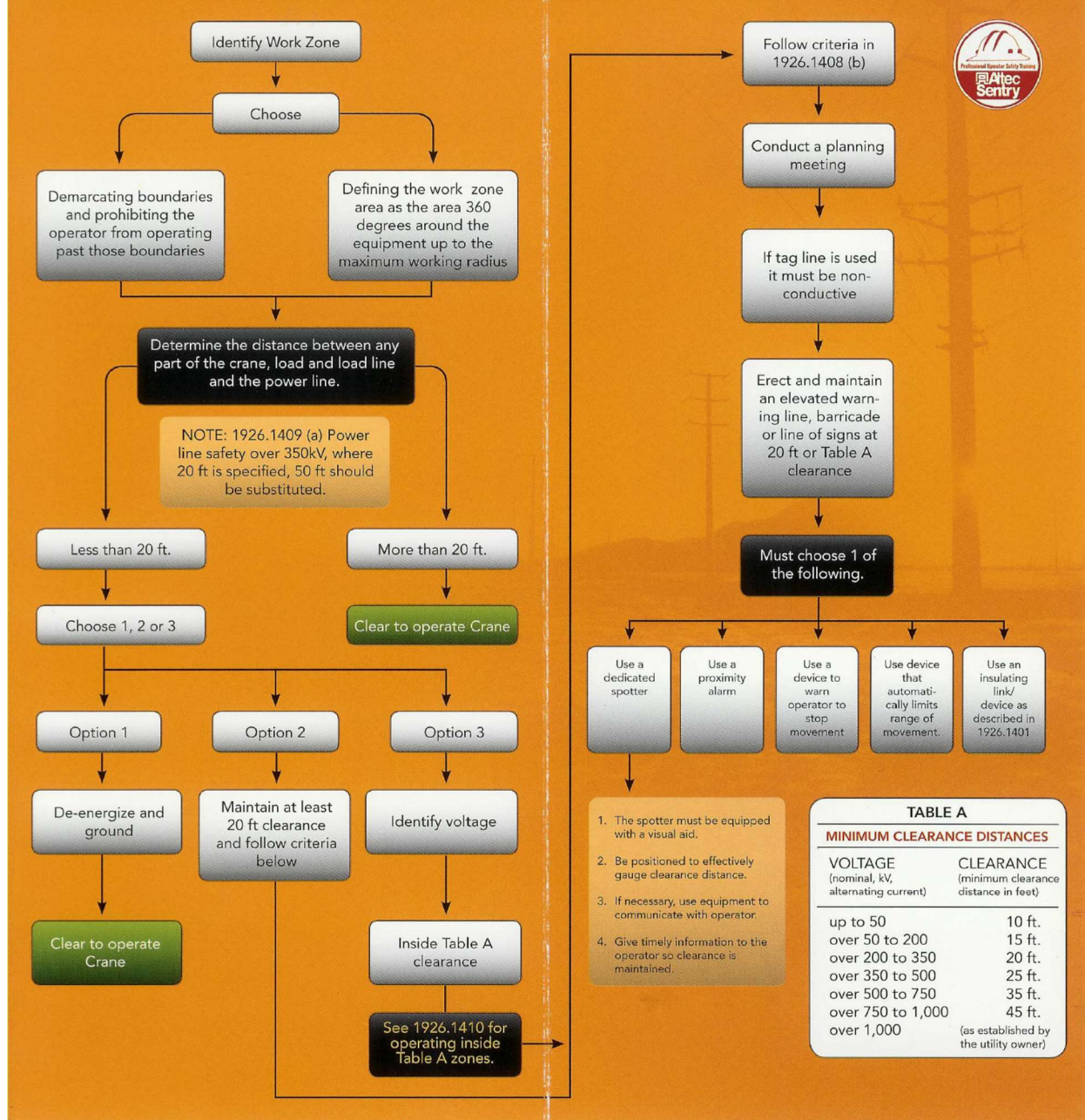


Figure 503-2. U-Bolt Wire Rope Clips

Figure 503-2. U-Bolt Wire Rope Clips



CORRECT METHOD = U-bolts of clips on short end of rope.
(Live end not distorted.)



WRONG METHOD = U-bolts on live end of rope. (This will kink strands on live end.)



WRONG METHOD = Staggered clips; two correct and one wrong.

503.11 Rigging Equipment

- a) All rigging equipment shall be of sufficient strength, proper type, and safe for its intended use.
- b) Rigging equipment shall not be loaded beyond its rated capacity.
- c) Before each use, all slings, fastenings, and attachments shall be inspected for damage or defects by a qualified person. Damaged or defective equipment shall be immediately removed from service.
- d) Makeshift lifting devices formed from bolts, rods, or reinforcing steel shall not be used.
- e) Slings shall not be shortened with knots, bolts, or other makeshift devices.

- f) Slings used in a basket hitch shall have the load balanced to prevent slippage.
- g) Unless used in a basket configuration, slings shall be securely attached to the load by the use of hooks with retaining devices or the use of shackles or other positive latching device.
- h) Slings shall be padded or protected from the sharp edges of their loads.
- i) A sling shall not be pulled from under a load when the load is resting on the sling.
- j) Slings shall be long enough to provide the maximum practical angle between the sling leg and the horizontal plane of the load.
- k) Shackle pins shall never be replaced with bolts or other non-approved devices.
- l) Only hooks with approved retaining devices shall be used. Hooks shall never be rigged so that they are point loaded at the tip of the hook. The load shall be securely seated in the saddle of the hook.
- m) When eye bolts are used, care shall be taken to ensure the bolt is not side loaded.
- n) For additional information concerning rigging equipment, refer to OSHA Standard 29 CFR 1910.184.

503.12 Aerial Devices

- a) Only authorized persons who are properly trained and qualified shall use or operate aerial devices.
- b) The operating and maintenance instruction manuals issued by the manufacturer shall be followed.
- c) Load limits of the boom and basket shall not be exceeded. Shock loading (sudden stops or starts) of the equipment shall be avoided.
- d) Aerial devices shall not be “field modified” unless such modification is certified by the manufacturer. The insulated portion shall not be altered in any manner that might reduce its insulating value.
- e) Prior to use, the equipment shall be given a warm-up period. The hydraulic system and the lift controls shall be checked and tested daily before use to determine if such features are in safe working condition. Malfunctions or unsafe operational conditions shall be reported. Equipment that is not in proper operational condition shall not be used.
- f) Articulating boom and extensible boom platforms, primarily designed as personnel carriers, shall have both platform (upper) and lower controls. Lower level controls shall not be operated unless permission has been obtained from the employee in the lift, except in case of emergency.
- g) The truck shall not be moved unless the boom is lowered, the basket cradled and secured, and the outriggers retracted.
- h) Employees shall not ride in the bucket while the truck is traveling. (Exceptions: Employees may ride in the basket for short moves at the work location if the basket is returned to the cradled position for each move and the employees face the direction of travel.)
- i) When employees are in the bucket of an aerial lift, the emergency brake of the vehicle shall be set. Wheel chocks or outriggers shall be used to provide added protection. When the vehicle is on an incline, wheel chocks shall be used regardless of whether outriggers are used. The truck should be approximately level when viewed from the rear.
- j) When outriggers are used, they shall be set on pads or on a solid surface. Outriggers shall not be extended or retracted outside of clear view of the operator unless all persons are outside the range of possible equipment motion.

- k) Employees shall not belt to an adjacent pole or structure. When working from an aerial lift, a harness shall be worn and a lanyard attached to an approved anchor point.
- l) Safety rules governing the use of live-line tools, rubber goods, personal protective equipment, and general safe practices shall also apply to work done from aerial baskets. (Exception: Different rules apply when “live-line bare-hand” work is performed.)
- m) When a boom must be maneuvered over a street or highway, necessary precautions shall be taken to avoid accidents with traffic and pedestrians.
- n) The operator shall always face in the direction in which the basket is moving and shall see that the path of the boom or basket is clear when it is being moved.
- o) Employees shall not stand or sit on top or edge of the basket or on ladders placed in the basket. Employees’ feet shall be on the floor of the basket the entire time they are in it.
- p) Climbers shall not be worn by employees while in the basket.
- q) When two employees are in the basket or baskets, one of them shall be designated to operate the controls. One employee shall give all signals, which shall be thoroughly understood by all persons concerned.
- r) When two employees are working from the basket, extreme care shall be taken to avoid one employee contacting poles, crossarms, or other grounded or live equipment while the second employee is working on equipment at a different potential.
- s) In no case shall more than one energized conductor or phase be worked at one time.
- t) **(1) Minimum Approach Distance.**
Mechanical equipment shall be operated so that the minimum approach distances, established by the employer under § 1926.960(c)(1)(i), are maintained from exposed energized lines and equipment. However, the insulated portion of an aerial lift operated by a qualified employee in the lift is exempt from this requirement if the applicable minimum approach distance is maintained between the un-insulated portions of the aerial lift and exposed objects having a different electrical potential.
(Exception: Direct contact may be made when performing “live-line bare-hand” work.) Refer to (Reference to Grand Valley Power Table - AC Live Line Work MAD Pg 97)
- u) When using pneumatic or hydraulic tools in a bucket, the operator shall be sure that hoses or lines do not become entangled in the operational controls.
- v) Aerial basket vehicles working adjacent to energized conductors or equipment shall be properly grounded or barricaded and treated as energized.
- w) For additional information concerning aerial lifts, refer to OSHA Standards 29 CFR 1910.67 and 29 CFR 1910.269.

503.13 Reporting GVP Vehicle Accidents

- a) The driver shall report accurately and immediately every accident involving a vehicle in their possession, according to GVP policy. Additional reports shall be made to the police or state authority as required.
- b) The driver shall not discuss or argue the causes or results of an accident with other parties but shall secure all pertinent facts and information. Questions asked by proper authority shall be answered, but under no circumstances shall fault or negligence be admitted or any statement signed for anyone except proper representatives of GVP.
- c) Should the other driver demand immediate action, referral shall be made to the employee’s supervisor.

- d) The driver, when involved in an accident, shall stop and give his name and address, and the employer's name and address. The driver shall also secure the name and address of others involved in the accident and of witnesses to the accident (this is very important). The driver shall also note position of the vehicle(s) after the collision in reference to edge of road, sidewalk line, center of intersection, etc.
- e) If any person is injured as the result of the vehicle accident, employees shall see that necessary emergency aid is provided.
- f) Near misses as well as actual accidents should be reported, according to GVP policy.

503.14 Portable and Vehicle Mounted Generators

- a) The generator may only supply equipment located on the generator or the vehicle and cord- and plug-connected equipment through receptacles mounted on the generator or the vehicle.
- b) The non-current-carrying metal parts of the equipment and the equipment grounding conductor terminals of the receptacles shall be bonded to the generator frame.
- c) In the case of vehicle mounted generators, the frame of the generator shall be bonded to the vehicle frame.
- d) Any neutral conductor shall be bonded to the generator frame.

504 Vehicle Maintenance

504.1 General

- a) Stationary jack stands or supports must be used when working under vehicles and equipment.
- b) Vehicle lift devices (grease rack) are to be operated by authorized personnel only.
- c) Dump boxes, booms, and other hydraulic lifting or loading units shall be securely blocked when servicing.
- d) Wheels shall be chocked as appropriate on vehicles and equipment during servicing.

504.2 Vehicle Batteries

- a) Batteries in storage must be maintained in a well-ventilated area and secured to prevent spillage of acid contents.
- b) Battery charging and jump starting shall be done in accordance with industry practice by connecting and disconnecting the positive and negative terminals in a manner that will prevent sparking.

504.3 Hydraulic Systems

- a) Hydraulic fluids shall be contained in proper containers when employees are draining these systems.
- b) Checking for hydraulic leaks requires the use of proper tools and procedures. No employee shall use their hands to check for hydraulic leaks.

504.4 Spray Painting

- a) Spray painting areas must be secured, properly ventilated, and warning signs posted to prevent unauthorized persons from entering the area.
- b) Only authorized persons shall operate paint booths.

504.5 Servicing Multipiece and Single Piece Wheel Rims

For information concerning the servicing of multipiece and single piece wheel rims, refer to OSHA Standard 29 CFR 1910.177.

504.6 Maintenance and Inspection of GVP Fleet Vehicles

- a) Unit operator is responsible for inspection checks and lubrication in accordance with the manufacturer's operation and maintenance manual (for the truck as well as the mounted equipment.)
- b) Proper maintenance of fiberglass components is essential for the components to maintain their dielectric properties and appearance. The exterior surface of fiberglass components, including upper control tubes, lower boom inserts, etc., should be cleaned and inspected pursuant to manufacturer's recommendations. This fiberglass maintenance should be performed as indicated in the manufacturer's operation and maintenance manual.
- c) In cases where there is a question about the condition of equipment, a competent person should be consulted and necessary inspection and repairs completed promptly.
- d) Repairs to the fuel and ignition systems of industrial trucks which involve fire hazards shall be conducted only in locations designated for such repairs.
- e) Trucks in need of repairs to the electrical system shall have the battery disconnected prior to such repairs.
- f) All parts of any industrial truck requiring replacement shall be replaced by only parts equivalent as to safety with those used in the original design.
- g) When the temperature of any part of any truck is found to be in excess of its normal operating temperature, thus creating a hazardous condition, the vehicle shall not be returned to service until the cause for such overheating has been eliminated.
- h) Industrial trucks shall be kept in a clean condition, free of lint, excess oil, and grease. Noncombustible agents should be used for cleaning trucks. Low flash point (below 100° F) shall not be used. High flash point (at or above 100° F) solvents may be used. Precautions regarding toxicity, ventilation, and fire hazard shall be taken according to the agent or solvent used.
- i) For more information on the maintenance of industrial trucks, refer to OSHA 20 CFR 1910.178(q).

504.7 Defective Vehicle Tagout

- a) A defective equipment tag is to be used when vehicles or equipment are deemed unsafe to operate. The defective equipment tag indicates a unit shall not be operated for any reason.
- b) Vehicles and equipment may be tagged out during servicing at the discretion of the Fleet Technician.
- c) A unit with two systems, i.e., cab and chassis and separate aerial device, may be tagged independently of each other with the approval of the Vehicle Maintenance Supervisor.
- d) Tags shall be signed and dated by the Fleet Technician performing the work.
- e) Restricted Use Tags are intended to restrict operation of vehicles or equipment to the Servicing Fleet Technician(s). The restricted use tag allows only the Servicing Fleet Technician to operate vehicles or equipment while repairs are being made.
- f) Refer to GVP-specific fleet lockout-tagout procedures for additional requirements.

505 Work Zone Safety (Traffic Control)

505.1 General

- a) Work area protection is the adequate safeguarding or protecting of pedestrians, motorists, GVP workers, and equipment by the use of adequate barriers, warning signs, lights, flags, traffic cones, high level standards, barricade rope, flagmen, etc., on approaches to work areas, excavations, open manholes, parked equipment, etc.
- b) Work area protection is accomplished by the use of good informative and protective devices, keeping in mind that a safe installation requires the use of these devices in relation to the location of the workers and the equipment involved. The use of these devices must be coupled with proper planning, design, installation, inspection, maintenance, and the use of good common sense. It is of the utmost importance that the work area be properly identified and that warning devices clearly convey the message to the traveling public well in advance of arrival at the work area.
- c) The public must be warned in advance, then regulated and guided safely through or around the work area. Proper work area protection shall be planned to ensure the safety and protection of the public, the worker, and the equipment.
- d) The possibility of accidents occurring is greatly minimized by proper planning, design, installation, operation, and maintenance, coupled with the use of common sense.
- e) Refer to Part VI of the most current edition of the *Manual on Uniform Traffic Control Devices*.
- (f) For additional information concerning work area protection, refer to OSHA Standard 29 CFR 1926.200-203; 1926.200(g)(2); 1910.269(w)(6)(i)(ii)(iii)(iv)(v).

505.2 Equipment

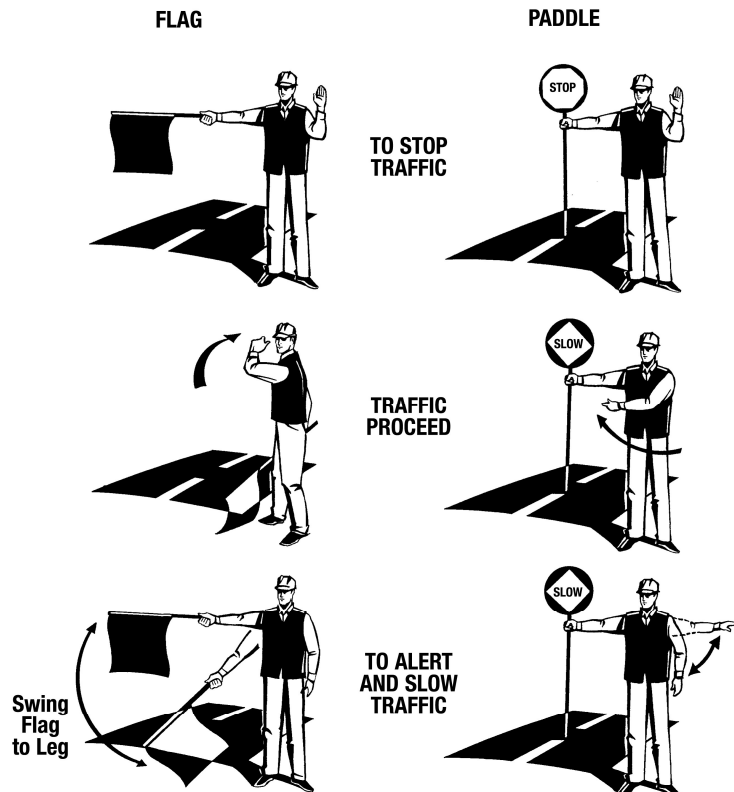
- a) Only those signs, standards, barricades, flags, and cones that conform to state or local codes shall be used.
- b) All state and local traffic codes shall be followed when providing work area protection.
- c) During night operations or in periods of reduced visibility, special precautions shall be taken. Adequate warning equipment, which may include flashing lights, flares, or area illumination, shall be used.
- d) Warning devices and equipment shall be removed as soon as the hazard is eliminated.
- e) Warning devices and equipment not in use shall be stored in a proper manner or shall be removed from the work area.

505.3 Flagmen

- a) Flagmen or other appropriate traffic controls shall be used to supplement protection provided by signs, signals, and barricades whenever necessary.
- b) For daytime work the flag men shall wear a minimum of a Class III vest, shirt or jacket of an orange, yellow, yellow-green or fluorescent version of these colors. For nighttime work, Class III vest, shirt or jacket consisting of a retro-reflective material shall be worn. 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.
- c) Flagmen using hand-signaling equipment (Figure 505-1) shall ensure signals provide sufficient warning to protect themselves and the worksite. The use of sign paddles is preferred and the following should be used if available:

- (1) Signal flags shall be red and at least 24 inches square.
 - (2) Sign paddles (Stop and Slow) shall be on a 6 foot staff, and of the appropriate size and shape.
 - (3) In periods of darkness or reduced visibility, red lights shall be used.
- d) Flagmen shall place themselves in a protected position to reduce possibility of injury from traffic.
- e) Flagmen shall ensure they can fully observe the operation and shall guide vehicular traffic in such a manner as to minimize the possibility of accidents or injury.

Figure 505-1. Use of Hand-Signaling Devices by Flaggers



- f) When flagmen are used at both ends of a jobsite, reliable communications or prearranged signals shall be used to ensure proper traffic flow.
- g) Flagmen shall face traffic when giving signals.
- h) Flagmen shall give positive, direct signals that leave no doubt as to their meaning.
- i) For additional information concerning high-visibility safety apparel and head gear, refer to ANSI/ISEA 107-2010.
- j) Refer to state and local regulations for additional information on flagmen procedures.

506 Tools and Equipment

506.1 Hand Tools

- a) All tools, regardless of ownership, shall be of an approved type and maintained in good condition. (Tools are subject to inspection at any time. Supervisors have the authority and responsibility to condemn unserviceable tools, regardless of ownership.)
- b) Defective tools shall be tagged to prevent their use, or they shall be removed from the jobsite.
- c) Employees shall always use the proper tool for the job performed. Makeshift and substitute tools shall only be used with proper authorization and under supervision.
- d) Hammers with metal handles, screwdrivers or knives with metal continuing through the handle, and metallic measuring tapes shall not be used on or near energized electrical circuits or equipment.
- e) Tools shall not be thrown from place to place or from person to person; tools that must be raised or lowered from one elevation to another shall be placed in tool buckets or firmly attached to hand lines.
- f) Tools shall never be placed unsecured on elevated places.
- g) As impact tools such as chisels, punches, drift pins, etc., become mushroomed or cracked, they shall be dressed, repaired, or replaced before further use.
- h) Chisels, drills, punches, ground rods, and pipes shall be held with suitable holders or tongs (not with the hands) while being struck by another employee.
- i) Shims shall not be used to make a wrench fit.
- j) Wrenches with sprung or damaged jaws shall not be used.
- k) Pipe shall not be used to extend a wrench handle for added leverage unless the wrench was designed for such use.
- l) Tools shall be used only for the purposes for which they have been approved.
- m) Tools with sharp edges shall be stored and handled so that they will not cause injury or damage. They shall not be carried in pockets.
- n) Wooden handles that are loose, cracked, or splintered shall be replaced. The handle shall not be taped or lashed with wire.
- o) All cutting tools such as saws, wood chisels, drawknives, or axes shall be kept in suitable guards or in special compartments.
- p) Tools shall not be left lying around where they may cause a person to trip or stumble.
- q) When employees are working on or above open grating, a canvas or other suitable covering shall be used to cover the grating to prevent tools or parts from dropping to a lower level where others are present, or the danger area shall be barricaded or guarded.
- r) The insulation on hand tools shall not be depended upon to protect users from electric shock.
- s) When using such tools as screwdrivers and wrenches, employees should avoid using their wrists in a bent (flexed), extended, or twisted position for long periods of time. Employees should maintain their wrists in a neutral (straight) position.
- t) For additional information concerning hand tools, refer to OSHA Standard 29 CFR 1910.242.

506.2 Portable Electric Tools

- a) The 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 isolating transformer or other isolated power supply, such as a 24V dc system.
- b) All powered tools shall be examined before use to ensure general serviceability and the presence of all applicable safety devices. The electric cord and electric components shall be given an especially thorough examination.
- c) Powered tools shall be used only within their capability and shall be operated in accordance with the instructions of the manufacturer.
- d) All tools shall be kept in good repair and shall be disconnected from the power source while repairs are being made.
- e) Electrical tools shall not be used where there is a hazard of flammable vapors, gases, or dusts.
- f) Tools connected to a central power supply, including portable and vehicle mounted generators (not isolated and not double-insulated), shall be protected by a Ground Fault Interrupter (GFI) or by an “assured grounding system.”
- g) Any cord and plug connected equipment supplied by other than premises wiring shall comply with one of the following:
 - (1) Equipped with a cord containing an equipment grounding conductor connected to the tool frame.
 - (2) Double insulated.
 - (3) Connected to the power supply through an isolating transformer with an ungrounded secondary **with a voltage of no more than 50 volts.**
- h) For additional information concerning portable electric tools, refer to OSHA Standards 29 CFR 1910, Subpart P, and 29 CFR 1910.269.

506.3 Pneumatic Tools

- a) Compressed air and compressed air tools shall be used with caution.
- b) Pneumatic tools shall never be pointed at another person.
- c) Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tool from becoming accidentally disconnected.
- d) Safety clips or retainers shall be securely installed and maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.
- e) Compressed air shall not be used for cleaning purposes except when reduced to less than 30 pounds per square inch (psi), and then only with effective chip guarding and personal protective equipment.
- f) Compressed air shall not be used to blow dust or dirt from clothing.
- g) The manufacturer’s safe operating pressure for hoses, pipes, valves, filters, and other fittings shall not be exceeded.
- h) The use of hoses for hoisting or lowering tools shall not be permitted.
- i) All hoses exceeding 1/2 inch inside diameter shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure or disengagement of a connection.

- j) Before making adjustments or changing air tools, unless equipped with quick-change connectors, the air shall be shut off at the air supply valve ahead of the hose. The hose shall be bled at the tool before breaking the connection.
- k) Eye protection, foot protection, and other protective devices shall be worn when their use could reduce the possibility of injury.
- l) Pneumatic tools shall be operated only by competent persons who have been trained in their use.
- m) A pneumatic tool used where it may contact exposed live electrical parts shall have a nonconductive hose and an accumulator to collect moisture.
- n) Employees shall not use any part of their bodies to locate or attempt to stop an air leak.
- o) For additional information concerning pneumatic tools, refer to OSHA Standards 29 CFR 1910, Subpart P, and 29 CFR 1910.269.

506.4 Hydraulic Tools

- a) Manufacturers' safe operating pressures for hydraulic tools, hoses, valves, pipes, filters, and fittings shall not be exceeded.
- b) Pressure shall be released before connections are broken unless quick-acting, self-closing connectors are used.
- c) Employees shall wear appropriate personal protective equipment and shall not use any part of their bodies to locate and attempt to stop a hydraulic leak.
- d) The fluid used in hydraulic powered tools shall be fire resistant and shall retain its operating characteristics at the most extreme temperatures to which it will be exposed.
- e) All hydraulic lines longer than 35 feet should have check valves or provide for loss of insulating value due to partial vacuum, when used where they may come into contact with exposed live parts.

506.5 Power Lawn Mowers, Edgers, etc.

- a) Employees shall ensure that all applicable guards are in place prior to using power lawn mowers.
- b) All power lawn mowers shall be equipped with adequate guards, which shall remain in place while the mower is in use.
- c) Prior to making adjustments, inspections, or repairs, the employee shall turn off the mower and permit it to come to a complete stop.
- d) When operating a power mower, the employee shall perform the following:
 - (1) Remove any rocks, pieces of wire, or other foreign objects from the area to be mowed.
 - (2) Avoid placing the body in front of the discharge opening.
 - (3) Mow across the face of a slope or incline.
 - (4) Wear proper protective equipment including, as a minimum, safety glasses or safety goggles, appropriate hearing protection, and proper footwear.
- e) For additional information concerning power lawn mowers, edgers, etc., refer to OSHA Standard 29 CFR 1910.243.

506.6 Powder-Actuated Tools

- a) Only those employees who are trained and qualified in their operation shall use powder-actuated tools.

- b) Explosive charges shall be carried and transported in approved containers.
- c) Operators and assistants using these tools shall be safe-guarded by means of eye protection (safety eye goggles or face shields), a safety hat, and appropriate hearing protection.
- d) Tools shall be maintained in good condition and serviced regularly by qualified persons. The material upon which these tools are to be used shall be examined before work is started for the purpose of determining its suitability and eliminating the possibility of hazard to the operator and others.
- e) Prior to use, the operator shall ensure that the protective shield is properly attached to the tool.
- f) Prior to use, the operator shall inspect the tool to determine if it is clean, if moving parts operate freely, and if the barrel is free from obstructions.
- g) A defective tool shall be tagged and immediately removed from service.
- h) Powder-actuated tools shall not be used in an explosive or flammable atmosphere.
- i) Tools shall not be loaded until just prior to the intended firing.
- j) Only cartridges with an explosive charge adequate for the job and with proper penetration shall be used.
- k) Tools and cartridges shall never be left unattended.
- l) Tools shall never be pointed at any person.
- m) In case of a misfire, the operator shall hold the tool in place for 30 seconds. He shall then try to operate the tool a second time and then wait another 30 seconds. Misfired cartridges shall be disposed of properly (placed in metal container and returned to supervisor).
- n) Only powder charges, studs, or fasteners specified by the manufacturer for the specific tool shall be used.
- o) For additional information concerning powder-actuated tools, refer to OSHA Standard 29 CFR 1910.243.

506.7 Safe Supports and Scaffolds

- a) No employee, or any material or equipment, shall be supported or permitted to be supported on any portion of a tree, pole structure, scaffold, ladder, walkway, or other elevated structure, crane or derrick, etc., without first determining that such support is adequately strong and properly secured in place.
- b) Employees shall check all scaffolding before use to ensure it is of sufficient strength and rigidity to safely support the weight of the persons and material to which it will be subjected.
- c) Scaffolds 4 feet to 10 feet in height, having a minimum horizontal dimension in either direction of less than 45 inches, shall have standard guardrails installed on all open sides and ends of the platform.
- d) Guardrails and toeboards shall be installed on all open sides and ends of platforms more than 10 feet above the ground or floor.
- e) Scaffold planks shall extend over their end supports by not less than 6 inches (unless cleated) nor more than 12 inches.
- f) Scaffolds shall not be moved without first removing all loose tools, materials, and equipment resting on the scaffold deck.
- g) All scaffolds shall be sufficiently secured and braced.
- h) The footing and anchorage points for scaffolds shall be sound, rigid, and capable of carrying the maximum intended load without settling or displacement. Unstable objects such as barrels, boxes, loose brick, or concrete blocks shall not be used to support scaffolds or planks.

- i) Scaffolds shall not be altered or moved horizontally while being used or occupied except when specifically designed for such use. Movable scaffolds shall have the casters or wheels locked to prevent movement.
- j) The width of all scaffolds, ramps, and platforms shall be sufficient to prevent congestion of persons, materials, or equipment, and in no case shall they be less than 18 inches wide.
- k) Synthetic or natural fiber rope shall not be used as guardrails.
- l) Employees working on suspended scaffolds shall be protected by an independent lifeline, body harness, and a lanyard.
- m) Safe access shall be provided for all scaffolds. Structural members should not be used as a means of access.
- n) For additional information concerning safe supports and scaffolds, refer to OSHA Standards 29 CFR 1910.28 and 29 CFR 1910.29.

506.8 Ladders--General

- a) Wooden ladders shall not be painted so as to obscure a defect in the wood; only a clear, nonconductive finish shall be used.
- b) All ladders shall be inspected frequently and regularly. Ladders with weakened, broken, or missing steps, broken side rails, or other defects shall be tagged and removed from service.
- c) Ladders shall be sufficiently strong for their intended use.
- d) Portable metal ladders and other portable conductive ladders shall not be used in the vicinity of exposed energized lines and equipment. (Exception: Such ladders may be used in specialized work, such as high voltage substations, where nonconductive ladders might present a greater hazard. These ladders shall be properly marked.)
- e) Ladders shall not be placed in front of doors opening toward the ladder unless the door is open, locked, or guarded.
- f) When ascending or descending ladders, employees shall have both hands free and shall face the ladder.
- g) Only one employee shall work from a ladder at one time (except for hook type ladders). If two employees are required, a second ladder shall be used.
- h) Only GVP-owned ladders shall be used by employees.
- i) Ladders shall not be used as scaffold platforms unless specifically designed for that purpose.
- j) Boxes, chairs, etc., shall not be used as ladders.
- k) All ladders shall be capable of supporting at least 2.5 times the maximum intended load without failure.
- l) When working from a portable ladder, the ladder must be securely placed, held, tied, or otherwise made secure to prevent slipping or falling.
- m) The use of step ladders above 20 feet is prohibited and the use of extension ladders above 24 feet is strongly discouraged. Refer to GVP's ladder policy.
- n) Ladders of all types should never be left in place when employees leave the worksite for an extended period of time. They shall be laid on the ground or floor in a safe location or returned to the truck (storage position).
- o) For additional information concerning ladder requirements, refer to OSHA Standards 29 CFR 1910.25, 29 CFR 1910.26, and 29 CFR 1910.27.

506.9 Straight Ladders

- a) Portable straight ladders shall not be used without nonskid bases.
- b) The ladder shall be placed so that the distance between the bottom of the ladder and the supporting point is approximately one-fourth of the ladder length between supports.
- c) Straight ladders shall not be climbed beyond the third step from the top.
- d) When dismounting from a ladder at an elevated position (such as a roof), the employee shall ensure that the ladder side rails extend at least 3 feet above the dismount position, or that grab bars are present. When climbing, the employee shall maintain three points of contact with the ladder at all times.
- e) Employees shall belt off to a pole ladder whenever both hands must be used for the job or a possibility of the employee falling from an elevated position exists.
- f) Ladders shall not be spliced together to form a longer ladder, unless specifically designed to be used as a section ladder.
- g) A ladder shall not be placed against an unsafe support.

506.10 Step Ladders

- a) The top step shall not be used, except for platform ladders.
- b) Step ladder legs shall be fully spread and the spreading bars locked in place.
- c) Step ladders shall not be used as straight ladders.
- d) When an employee is working on a step ladder more than 10 feet high (except a platform ladder), the ladder shall be held by another person.

507 Overhead Distribution and Transmission

507.1 Working On or Near Exposed Energized Lines and Equipment

a) Only qualified employees and trainees working under their direct supervision may work on or with exposed energized lines or parts of equipment. Only qualified employees and trainees working under their direct supervision may work in areas containing unguarded, uninsulated energized lines or parts of equipment operating at 50 volts or more. When employees are performing work on or associated with exposed lines or equipment energized at 50 volts or more, persons trained in first aid and CPR shall be available as follows:

- (1) For field work involving two or more employees at a work location, at least two trained persons shall be available. Only one trained person needs to be available if all new employees are trained in first aid and CPR within 3 months of their hiring dates.**
- (2) For fixed work locations such as generating stations, the number of trained persons available shall be sufficient to ensure that each employee exposed to electric shock can be reached in 4 minutes by a trained person. Where the existing number of employees is not sufficient to meet this requirement (at a remote substation, for example), all employees at the work location shall be trained.**
- b) When employees are working on energized circuits or equipment where the voltage between any two conductors is more than 15 kV (nominal), the following minimum conditions shall be met in addition to all rules governing the use of protective equipment. These conditions are recommended to be met where the voltage between any two conductors is more than 2.4 kV nominal.**

- (1) Employees shall be isolated from all grounds (wooden poles shall be considered as grounds in this case) and conductors by using approved supplementary insulation such as aerial baskets or other approved insulated devices.
- c) At least two qualified employees will be present while the following types of work are being performed (except as noted in d) below):
- (1) Installation, repair or removal of de-energized lines if an employee is exposed to contact with other parts energized at more than 600 volts.
 - (2) Installation, repair or removal of lines energized at more than 600 volts.
 - (3) Installation, repair or removal of equipment such as transformers, capacitors and regulators, if an employee is exposed to contact with parts energized at more than 600 volts.
 - (4) Work involving the use of mechanical equipment, other than insulated aerial lifts, near parts energized at more than 600 volts.
 - (5) Any other work that exposes an employee to electrical hazards greater than or equal to those listed above.
- d) Two employees do not need to be present in the following operations:
- (1) Routine switching of circuits (if it can be done safely).
 - (2) Work performed with live-line tools if the employee is positioned so that they are not within reach of or otherwise exposed to energized parts.
 - (3) Emergency repairs necessary to safeguard the general public.
- e) Only qualified employees may work on or with exposed energized lines or parts of equipment. Only qualified employees may work in areas containing unguarded, uninsulated energized lines or parts of equipment operating at 50 volts or more. When two or more employees are working on the same pole, they shall only work on or contact the same conductor at one time unless they are in separate buckets.

Note: An employee undergoing on-the-job training who has demonstrated the ability to perform duties safely at his level of training and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties.

- f) No employee may approach or take any conductive object without an insulating handle closer to exposed energized parts than the minimum approach distances set forth in (Grand Valley Power Table (Pg 111), unless the employee is insulated from the energized part or the energized part is insulated from the employee and any other conductive object at a different potential, or the employee is insulated from any other conductive object, as during live-line bare-hand work. Refer to Sections 507.2, Flexible Protective Equipment, 507.5, Working on Energized Lines Barehanded, 507.8, Working on Transformers, and 509.5, Work on De-energized Cables, for related information.
- g) If the employee is insulated from the energized part, rubber insulating gloves and sleeves worn constitutes insulation of the employee from the energized part upon which the employee is working provided that the employee has **(Positive Control)** of the part in a manner sufficient to prevent exposure to un-insulated portions of the employee's body, and aerial device.
- h) For additional information concerning working on or near energized lines or equipment, refer to the OSHA Standards 29 CFR 1910.137; 1926.400; 1926.416; 1926.417; 1926.950; 1926.954; 1926.955; 1926.956; 1926.957.

i) 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.

j) 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.

k) 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.

l) 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.

m) Electrical equipment and lines shall always be considered "live" unless they are positively known to be dead by testing and grounding. Before starting to work, preliminary inspection or test shall be made to determine what conditions exist. Care shall be exercised to handle neutral wires with the same caution that is used with energized wires.

n) 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.

o) Employees must evaluate existing conditions that relate to the safety of the work to be performed before work is started.

p) When two or more employees are working on the same structure, they shall only work on or contact the same conductor.

q) The automatic reclosing feature of circuit interrupting devices shall be placed in non-automatic reclose mode before work begins, if moving, cutting, repairing or performing hands-on rubber glove methods.

Exclusion: In the event that the site supervisor ensures that work is performed behind sufficient protective devices, they may determine that one of such interrupting devices is not required.

r) For additional information concerning overhead distribution and transmission requirements, refer to OSHA Standard 29 CFR 1910.269.

Grand Valley Power						
AC Live-Line Work Minimum Approach Distance						
301-5kV:	MAD=M+D					
5.1kV-72.5kV:	MAD=M+A*D					
Maximum altitude on GVP system on Grand Mesa = 11,000' (3,352m)						
m to ft conv	3.2808399					
M = inadvertent moment factor						
A = altitude correction factor						
D = electrical component of the minimum approach distance						
*All values calculated using OSHA regulations in CFR § 1926.960						
Meters						
Voltage Level (Ø-Ø)	M Table (V-2)	A Table (V-4)	D (m) (Ø-G)	D (m) (Ø-Ø)	Total MAD (m) (Ø-G)	Total MAD (m) (Ø-Ø)
120-300V					Avoid Contact	Avoid Contact
480V	0.31		0.02	0.02	0.33	0.33
12.5kV	0.61	1.25	0.04	0.07	0.66	0.70
24.9kV	0.61	1.25	0.16	0.28	0.81	0.96
69kV	0.61	1.25	0.39	0.59	1.10	1.35
Feet						
Voltage Level (Ø-Ø)	M Table (V-2)	A Table (V-4)	D (ft) (Ø-G)	D (ft) (Ø-Ø)	Total MAD (ft) (Ø-G)	Total MAD (ft) (Ø-Ø)
120-300V					Avoid Contact	Avoid Contact
480V	1.02		0.07	0.07	1' 1"	1' 1"
12.5kV	2.00	1.25	0.13	0.23	2' 2"	2' 4"
24.9kV	2.00	1.25	0.52	0.92	2' 8"	3' 2"
69kV	2.00	1.25	1.28	1.94	3' 8"	4' 6"

Table 507-2. 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
60.1 to 750	4.79	15-9	5.08	16-8
¹ For voltages above 72.6 kV, distances were calculated using a TOV value of 1.8.				
² The 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.				
³ For 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.				
⁴ Distances 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).				

Table 507-4. Communication Work Minimum Approach Distances (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	0.64 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 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	1.49 m	1.63 m
121.1 kV to 145.0 kV	1.60 m	1.70 m	1.85 m
145.1 kV to 169 kV	1.78 m	1.88 m	2.08 m
169.1 kV to 242 kV	2.29 m	2.44 m	2.72 m
242.1 kV to 362 kV	3.70 m	3.96 m	4.50 m
362.1 kV to 420 kV	4.55 m	4.88 m	5.54 m
420.1 kV to 550 kv	5.38 m	5.77 m	6.58 m
550.1 kV to 800 kV	7.19 m	7.72 m	8.84 m
¹ For single-phase lines off three-phase systems, use the phase-to-phase voltage of that system. ² For single-phase systems, use the highest voltage available. ³ Distances listed are for standard atmospheric conditions. The data used to calculate Table 431-1(m) 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 24 km per h, and normal barometric pressure with unsaturated and uncontaminated air. ⁴ The data used to formulate values in this table for voltages above 72.5 kV was obtained from IEEE Std 516-2009 using phase-to-ground exposure with the maximum T values of 3.5 for 72 kV to 420 kV, 3.0 for 420 kV to 550 kV, and 2.5 for 800 kV and a C2.1.1 tool factor. A 2 ft distance was added to the calculated values: one foot is added for inadvertent movement (as per IEEE Std 516-2009) plus one extra foot added for communications worker over an electrical worker.			

Table 507-5. Communication Work Minimum Approach Distances (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 ²	Not specified		
51 to 300 V ²	Avoid contact		
301 to 750 V ²	1 ft -1 in		
751 V to 15 kV	2 ft-2 in		
15.1 kV to 36 kV	3 ft-3 in		
36.1 kV to 46 kV	3 ft-6 in		
46.1 kV to 72.5 kV	4 ft-0 in		
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	4 ft-11 in	5 ft-5 in
121.1 kV to 145.0 kV	5 ft-3 in	5 ft-7 in	6 ft-1 in
145.1 kV to 169 kV	5 ft-10 in	6 ft-2 in	6 ft-0 in
169.1 kV to 242 kV	7 ft-6 in	8 ft-0 in	8 ft-11 in
242.1 kV to 362 kV	12 ft-2 in	13 ft-0 in	14 ft-9 in

362.1 kV to 420 kV	14 ft-11 in	16 ft-0 in	18 ft-2 in
420.1 kV to 550 kV	17 ft-8 in	18 ft-11 in	21 ft-7 in
550.1 kV to 800 kV	23 ft-7 in	25 ft-4 in	29 ft-0 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 data used to formulate values in this table for voltages above 72.5 kV was obtained from IEEE Std 516-2009 using phase-to-ground exposure with the maximum T values of 3.5 for 72 kV to 420 kV, 3.0 for 420 kV to 550 kV, and 2.5 for 800 kV and a C2.1.1 tool factor. A 2 ft distance was added to the calculated values: one foot is added for inadvertent movement (as per IEEE Std 516-2009) plus one extra foot added for communications worker over an electrical worker.

507.2 Flexible Protective Equipment

- a) Flexible protective equipment should be considered as only accidental contact and in no case should it be depended on as giving complete protection.
- b) Employees shall not touch or work on any exposed energized lines or apparatus except when wearing protective equipment approved for the voltage to be contacted. Insulating sleeves shall be worn with insulating gloves. Insulating sleeves need not be worn under the following conditions:
 - (1) If exposed energized parts not being worked on are insulated from the employee, and
 - (2) The insulation is placed from a position not exposing the employee's upper arm to contact with other energized parts.
- c) When work is to be done on or near energized lines, all energized and grounded conductors or guy wires within reach of any part of the body shall be covered with rubber protective equipment, except that part of the conductor on which the employee is to work.
- d) When working on energized lines or apparatus, work should be done from below, if possible.
- e) In applying flexible protective equipment, an employee shall always protect the nearest and lowest wires first, protecting themselves as they progress. The protective equipment shall extend beyond the reach of the employee's anticipated work position or extended reach distance. In removing rubber protective equipment, the reverse order shall be maintained.
- f) Flexible blankets shall not be used on the ground without protecting them from physical damage and moisture by means of a tarpaulin, canvas, or protective mat.
- g) Protective equipment shall be put on before entering the work area within which energized lines or apparatus may be reached and shall not be removed until the employee is completely out of reach of this area.
- h) To avoid corona and ozone damage, rubber protective equipment shall not be allowed to remain in place on energized lines or apparatus overnight or for more than one 8 hour period, unless approved by the supervisor in charge.
- i) Flexible protective equipment shall be stored in special compartments on trucks and containers provided so that they will not be damaged by tools, chemicals, or other equipment.

- j) Bare communications conductors shall be treated as energized lines and shall be protected accordingly.
- k) Blankets, gloves and sleeves shall be produced by a seamless process and will be marked with the appropriate class and type. The markings shall be nonconductive.
- l) Electrical protective equipment shall be given periodic testing as shown in Table 507-7.
- m) Equipment shall be free from harmful physical irregularities that can be detected by the tests or inspections required under this section.
- n) Flexible protective equipment shall be inspected for damage before each use and immediately following any incident that can reasonably be suspected of having caused damage.
- o) Refer to Table 507-6 for rubber insulating equipment voltage requirements.
- p) For additional information concerning flexible protective equipment refer to Section 407, Use and Care of Rubber Gloves, Section 509.9, Rubber Glove Use, and OSHA Standards 29 CFR 1910.137 and 29 CFR 1910.269.

Table 507-6. Rubber Insulating Equipment Voltage Requirements
(See: OSHA 29 CFR 1910.137 Table I-5)

	Class of Equipment Maximum Use Voltage* (a-c-rms) Retest Voltage** (a-c-rms) Retest Voltage** (d-c-avg)		
0	1,000	5,000	20,000
1	7,500	10,000	40,000
2	17,000	20,000	50,000
3	26,500	30,000	60,000
4	36,000	40,000	70,000

*The maximum use voltage is the ac voltage (rms) classification of the protective equipment that designates the maximum nominal design voltage of the energized system that may be safely worked. The nominal design voltage is equal to the phase-to-phase voltage on multiphase circuits. However, the phase-to-ground potential is considered to be the nominal design voltage:

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

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

Table 507-7. Rubber Insulating Equipment Test Intervals (See OSHA 1910.137 Table I-6)	
Rubber Insulating Equipment	When to Test
Rubber Insulating Line Hose	6 Months
Rubber Insulating Cover	6 Months
Rubber Insulating Blankets	6 Months
Rubber Gloves	2 Months
Rubber Insulating Sleeves	6 Months
¹ . If the insulating equipment has been electrically tested about not issued for service, it may not be placed into service unless it has been electrically tested within the previous 12 months.	

507.3 Climbing and Working on Poles

- a) All poles and structures shall be carefully inspected before climbing to assure that they are in a safe condition for the work to be performed and that they are capable of sustaining the additional or unbalanced stresses to which they will be subjected. The types of abnormalities that should be checked are general condition, cracks, holes, shell rot and decay, knots, depth of setting, soil conditions and burn marks. Acceptable tests for poles are hammer tests and rocking tests.
- b) If poles or structures may be unsafe for climbing, they shall not be climbed until made safe by guying, bracing, or other adequate means.
- c) Wires shall not be attached to or removed from a pole or structure until it is certain the pole or structure will withstand the altered strain.
- d) Workers shall not wear their climbers while driving or riding in vehicles or when working on the ground, on ladders (except hook ladders), or on platforms in which the wearing of the climbers creates a hazard. Climbers shall be put on at the base of the pole and removed at the base of the pole unless gaffs are covered.
- e) Gaffs on climbers shall be kept within safe length limits (11/4 inches minimum), properly shaped, and sharp.
- f) Metal hooks, chains, etc., for holding tools or tape shall not be attached to body belt or harness. Leather or other nonconducting material shall be used for this purpose.
- g) The safety strap and/or the personal fall arrest system 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 and/or personal fall arrest system 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 and/or personal fall arrest system 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.
- h) Employees shall not trust their weight to guy wires, pins, braces, conductors, or other such equipment that might prove unstable.

- i) 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.
- j) When climbers are stored in the truck or tool room, the gaffs shall be covered.
- k) Hand line shall be hung in secure location when working on a pole or in a bucket.

Personal Protective Equipment.

(a) General.

Personal protective equipment shall meet the requirements of Subpart E of this part.

Note to paragraph (a): Paragraph (d) of § 1926.95 sets employer payment obligations for the personal protective equipment required by this subpart, including, but not limited to, the fall protection equipment required by paragraph (b) of this section, the electrical protective equipment required by § 1926.960(c), and the flame-resistant and arc-rated clothing and other protective equipment required by § 1926.960(g).

(b) Fall Protection.

(1) Personal Fall Arrest Systems.

(i) Personal fall arrest systems shall meet the requirements of Subpart M of this part.

(ii) Personal fall arrest equipment used by employees who are exposed to hazards from flames or electric arcs, as determined by the employer under § 1926.960(g)(1), shall be capable of passing a drop test equivalent to that required by paragraph (b)(2)(xii) of this section after exposure to an electric arc with a heat energy of 40 ± 5 cal/cm².

(2) Work-Positioning Equipment. Body belts and positioning straps for work positioning equipment shall meet the following requirements:

(i) Hardware for body belts and positioning straps shall meet the following requirements:

(A) Hardware shall be made of drop forged steel, pressed steel, formed steel, or equivalent material.

(B) Hardware shall have a corrosion resistant finish.

(C) Hardware surfaces shall be smooth and free of sharp edges.

(ii) Buckles shall be capable of withstanding an 8.9-kilonewton (2,000-pound-force) tension test with a maximum permanent deformation no greater than 0.4 millimeters (0.0156 inches).

(iii) D rings shall be capable of withstanding a 22-kilonewton (5,000-pound-force) tensile test without cracking or breaking.

(iv) Snaphooks shall be capable of withstanding a 22-kilonewton (5,000-pound-force) tension test without failure.

Note to paragraph (b)(2)(iv): Distortion of the snaphook release the keeper is considered to be tensile failure of a snaphook.

(v) Top grain leather or leather substitute may be used in the manufacture of body belts and positioning straps; however, leather and leather substitutes may not be used alone as a load-bearing component of the assembly.

(vi) Plied fabric used in positioning straps and in load-bearing parts of body

(viii) The cushion part of the body belt shall contain no exposed rivets on the inside and shall be at least 76 millimeters (3 inches) in width.

(ix) Tool loops shall be situated on the body of a body belt so that the 100 millimeters (4 inches) of the body belt that is in the center of the back, measuring from D ring to D ring, is free of tool loops and any other attachments.

(x) Copper, steel, or equivalent liners shall be used around the bars of D rings to prevent wear between these members and the leather or fabric enclosing them.

(xi) Snaphooks shall be of the locking type meeting the following requirements:

(A) The locking mechanism shall first be released, or a destructive force shall be placed on the keeper, before the keeper will open.

(B) A force in the range of 6.7 N (1.5 lbf) to 17.8 N (4 lbf) shall be required to release the locking mechanism.

(C) With the locking mechanism released and with a force applied on the keeper against the face of the nose, the keeper may not begin to open with a force of 11.2 N (2.5 lbf) or less and shall begin to open with a maximum force of 17.8 N (4 lbf).

(xii) Body belts and positioning straps shall be capable of withstanding a drop test as follows:

(A) The test mass shall be rigidly constructed of steel or equivalent material with a mass of 100 kg (220.5 lbf). For work-positioning equipment used by employees weighing more than 140 kg (310 lbf) fully equipped, the test mass shall be increased proportionately (that is, the test mass must equal the mass of the equipped worker divided by 1.4).

(B) For body belts, the body belt shall be fitted snugly around the test mass and shall be attached to the test structure anchorage point by means of a wire rope.

(C) For positioning straps, the strap shall be adjusted to its shortest length possible to accommodate the test and connected to the test-structure anchorage point at one end and to the test mass on the other end.

(D) The test mass shall be dropped an unobstructed distance of 1 meter (39.4 inches) from a supporting structure that will sustain minimal deflection during the test.

(E) Body belts shall successfully arrest the fall of the test mass and shall be capable of supporting the mass after the test.

(F) Positioning straps shall successfully arrest the fall of the test mass without breaking, and the arrest force may not exceed 17.8 kilonewtons (4,000 pounds-force). Additionally, snaphooks on positioning straps may not distort to such an extent that the keeper would release.

Note to paragraph (b)(2): When used by employees weighing no more than 140 kg (310 lbf) fully equipped, body belts and positioning straps

that conform to American Society of Testing and Materials *Standard Specifications for Personal Climbing Equipment*, ASTM F887–12e1, are deemed to be in compliance with paragraph (b)(2) of this section.

(3) Care and use of personal fall protection equipment.

(i) Work positioning equipment shall be inspected before use each day to determine that the equipment is in safe working condition. Work-positioning equipment that is not in safe working condition may not be used.

Note to paragraph (b)(3)(i): Appendix F to this subpart contains guidelines for inspecting work-positioning equipment.

(ii) Personal fall arrest systems shall be used in accordance with § 1926.502(d).

Note to paragraph (b)(3)(ii): Fall protection equipment rigged to arrest falls is considered a fall arrest system and must meet the applicable requirements for the design and use of those systems. Fall protection equipment rigged for work positioning is considered work-positioning equipment and must meet the applicable requirements for the design and use of that equipment.

(iii) The employer shall ensure that employees use fall protection systems as follows:

(A) Each employee working from an aerial lift shall use a fall restraint system or a personal fall arrest system. Paragraph (b)(2)(v) of § 1926.453 does not apply.

(B) Except as provided in paragraph (b)(3)(iii)(C) of this section, each employee in elevated locations more than 1.2 meters (4 feet) above the ground on poles, towers, or similar structures shall use a personal fall arrest system, work-positioning equipment, or fall restraint system, as appropriate, if the employer has not provided other fall protection meeting Subpart M of this part.

(C) Until March 31, 2015, a qualified employee climbing or changing location on poles, towers, or similar structures need not use fall protection equipment, unless conditions, such as, but not limited to, ice, high winds, the design of the structure (for example, no provision for holding on with hands), or the presence of contaminants on the structure, could cause the employee to lose his or her grip or footing. On and after April 1, 2015, each qualified employee 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.

Note 1 to paragraphs (b)(3)(iii)(B) and (b)(3)(iii)(C): These paragraphs apply to structures that support overhead electric power transmission and distribution lines and equipment. They do not apply to portions of buildings, such as loading docks, or to electric equipment, such as transformers and capacitors. Subpart M of this part contains the duty to provide fall protection associated with walking and working surfaces.

Note 2 to paragraphs (b)(3)(iii)(B) and (b)(3)(iii)(C): Until the employer ensures that employees are proficient in climbing and the use of fall protection under § 1926.950(b)(7), the employees are not considered “qualified employees” for the purposes of paragraphs (b)(3)(iii)(B) and (b)(3)(iii)(C) of this section.

These paragraphs require unqualified employees (including trainees) to use fall protection any time they are more than 1.2 meters (4 feet) above the ground.

(iv) On and after April 1, 2015, work positioning systems shall be rigged so that an employee can free fall no more than 0.6 meters (2 feet).

(v) Anchorages for work-positioning equipment shall be capable of supporting at least twice the potential impact load of an employee’s fall, or 13.3 kilonewtons (3,000 pounds-force), whichever is greater.

Note to paragraph (b)(3)(v): Wood-pole fall-restriction devices meeting American Society of Testing and Materials *Standard Specifications for Personal Climbing Equipment*, ASTM F887–12e1, are deemed to meet the anchorage-strength requirement when they are used in accordance with manufacturers’ instructions.

(vi) Unless the snaphook is a locking type and designed specifically for the following connections, snaphooks on work-positioning equipment may not be engaged:

(A) Directly to webbing, rope, or wire rope;

(B) To each other;

(C) To a D ring to which another snaphook or other connector is attached;

(D) To a horizontal lifeline; or

(E) To any object that is incompatibly shaped or dimensioned in relation to the snaphook such that accidental disengagement could occur should the connected object sufficiently depress the snaphook keeper to allow release of the object. Belts shall be constructed in such a way that no raw edges are exposed and the plies do not separate.

(vii) Positioning straps shall be capable of withstanding the following tests:

(A) A dielectric test of 819.7 volts, AC, per centimeter (25,000 volts per foot) for 3 minutes without visible deterioration;

(B) A leakage test of 98.4 volts, AC, per centimeter (3,000 volts per foot) with a leakage current of no more than 1 mA;

Note to paragraphs (b)(2)(vii)(A) and (b)(2)(vii)(B): Positioning straps that pass direct-current tests at equivalent voltages are considered as meeting this requirement.

(C) Tension tests of 20 kilonewtons (4,500 pounds-force) for sections free of buckle holes and of 15 kilonewtons (3,500 pounds-force) for sections with buckle holes;

(D) A buckle-tear test with a load of 4.4 kilonewtons (1,000 pounds-force); and

(E) A flammability test in accordance with Table V–1.

Appendix F to Subpart V of Part 1926—

Work-Positioning Equipment Inspection

Guidelines

I. Body Belts Inspect body belts to ensure that:

- A. The hardware has no cracks, nicks, distortion, or corrosion;
- B. No loose or worn rivets are present;
- C. The waist strap has no loose grommets;
- D. The fastening straps are not 100-percent leather; and
- E. No worn materials that could affect the safety of the user are present.

II. Positioning Straps Inspect positioning straps to ensure that:

- A. The warning center of the strap material is not exposed;
- B. No cuts, burns, extra holes, or fraying of strap material is present;
- C. properly secured;
- D. Straps are not 100-percent leather; and
- E. Snaphooks do not have cracks, burns, or corrosion.

III. Climbers Inspect pole and tree climbers to ensure that:

- A. Gaffs are at least as long as the manufacturer's recommended minimums (generally 32 and 51 millimeters (1.25 and 2.0 inches) for pole and tree climbers, respectively, measured on the underside of the gaff);

Note: Gauges are available to assist in determining whether gaffs are long enough and shaped to easily penetrate poles or trees.

- B. Gaffs and leg irons are not fractured or cracked;
- C. Stirrups and leg irons are free of excessive wear;
- D. Gaffs are not loose;
- E. Gaffs are free of deformation that could adversely affect use;
- F. Gaffs are properly sharpened; and
- G. There are no broken straps or buckles.

c) For additional information concerning fall protection requirements, refer to Section 203, Fall Protection, and OSHA Standards 29 CFR 1910.269; 1910.66 App. C; 1926.451; 1926.500; 1926.501; 1925.502; 1926.502 Subpart R App. G(b-e); 1926.502 Subpart M App. B-D; 1926.760; 1926.761; 1926.1423; 1926.1423.

507.4 Working on Energized Lines with Live-Line Tools/Hot Sticking

- a) Refer to Section 407 c), Use and Care of Rubber Gloves, and GVP policy concerning the use of rubber gloves with live-line tools. As a minimum requirement, rubber gloves shall be worn when making or breaking a circuit (such as switching and grounding procedures), when proper clearances cannot be maintained from underbuilt circuits, and during inclement weather.

- b) **Extreme caution shall be used when working (handling and moving) energized lines of #6 HD copper, #6 ACSR, and #8A Copperweld or smaller sized conductor. A detailed review should be included in the job briefing.**
Working on energized lines shall be accomplished as referenced in Section 507.1 Pg. 98 of this safety manual. A mechanical device such as an insulated jib may be used as practical to reposition energized conductor.
An Inspection shall be made to verify any hazards with in the work zone. All adjacent spans and structures shall be checked for damage. Personnel and Equipment shall not be located under the work zone. If performing work on energized conductor is deemed unsafe by the employee in charge, lines can be de-energized to perform the work.
- c) Planned work with live-line tools shall not be started during inclement weather. Inclement weather should be determined by GVP with proper consideration to the possible extreme weather scenarios specific to the climate of work.
- d) Before work with live-line maintenance tools is begun, the dispatcher or person having jurisdiction shall be notified. If during live-line tool work, an interruption to service occurs, the dispatcher or other person having jurisdiction shall be notified immediately.
- e) Only tools approved by GVP shall be used in live-line maintenance work.
- f) Under no circumstances shall a lineman depend on another worker to hold a live conductor clear of him.
- g) When moving heavy conductors, blocks shall be used on the live-line tool so that they may be moved slowly and carefully.
- h) While live-line work is in progress, no other work of any nature shall be performed on the same pole or structure.
- i) 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.
- j) 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.
- k) 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.
- l) Live-line tools used for primary employee protection shall be removed from service every 1 year for examination, cleaning, repair and service.
- m) The automatic reclosing feature of circuit interrupting devices shall be made inoperative before work begins.

507.5 Working on Energized Lines Barehanded

- a) Only employees who have been instructed and trained in live-line bare-hand work shall use the technique on energized circuits.
- b) Live-line bare-hand work shall not be performed on voltages less than 69 kV.
- c) Before using the live-line bare-hand technique on energized high voltage conductors or parts, a check shall be made of the following:

- (1) The voltage rating of the circuit on which the work is to be performed.
- (2) The clearance to ground of lines and other energized parts on which work is to be performed.
- (3) The voltage limitations of the aerial lift equipment intended to be used.
- d) Only equipment designed, tested, and intended for live-line bare-hand work shall be used.
- e) The automatic reclosing feature of circuit-interrupting devices shall be made inoperative before working on any energized line or equipment.
- f) Work shall not be performed during the progress of an electrical storm in the immediate vicinity.
- g) A conductive bucket liner or other suitable conductive device shall be provided for bonding the insulated aerial device to the energized line or equipment.
 - (1) The employee shall be connected to the bucket liner by use of conductive shoes, leg clips, or other suitable means.
 - (2) Where necessary, adequate electrostatic shielding for the voltage being worked or conductive clothing shall be worn.
- h) Only tools and equipment intended for live-line bare-hand work shall be used and such tools and equipment shall be kept clean and dry.
- i) Before the boom is elevated, the outriggers on the aerial truck shall be extended and adjusted to stabilize the truck, and the body of the truck shall be bonded to an effective ground or barricaded and considered as energized equipment.
- j) Before moving the aerial lift into the work position, all controls (ground level and bucket) shall be checked and tested to determine that they are in proper working condition.
- k) Arm current tests shall be made before starting work each day, each time during the day higher voltage is going to be worked, and when changed conditions indicate a need for additional tests.

This test shall consist of placing the bucket in contact with an energized source equal to the voltage to be worked upon for a minimum of 3 minutes. The leakage current shall not exceed 1 microampere per kilovolt of nominal line-to-line voltage. Work operations shall be suspended immediately upon any indication of a malfunction in the equipment.
- l) All aerial lifts to be used for live-line bare-hand work shall have dual controls (lower and upper) as required by the following:
 - (1) The upper controls shall be within easy reach of the employee in the basket. If a two-basket type lift is used, access to the controls shall be within easy reach from either basket.
 - (2) The lower set of controls shall be located near the base of the boom to permit override operation of equipment at any time.
- m) Before the employee contacts the energized parts to be worked, the conductive bucket liner shall be bonded to the energized conductor by means of a positive connection that shall remain attached to the energized conductor until the work on the energized circuit is completed. The bond should be designed to break away in the event an emergency requires the bucket to be lowered to the ground.
- n) The minimum clearance distances for live-line bare-hand work shall be as specified in GVP Power Arc-Flash Table (page 65) and Table 507-5. These minimum clearance distances shall be maintained from all grounded objects and from lines and equipment at a different potential than that to which the insulated aerial device is bonded unless such grounded

- objects or other lines and equipment are covered by insulated guards. These distances shall be maintained when approaching and leaving and when bonded to the energized circuit.
- o) The use of hand lines between buckets, booms, and the ground is prohibited.
 - p) No conductive materials more than 36 inches long shall be placed in the bucket, except for appropriate length jumpers, armor rods, and tools.
 - q) Uninsulated equipment or material shall not be passed between a pole or structure and an aerial lift while an employee working from the bucket is bonded to an energized part.
 - r) Nonconductive type hand lines may be used from line to ground when not supported from the bucket.
 - s) A minimum clearance table (as shown in GVP Power Arc-Flash Table (page 65) shall be printed on a plate of durable nonconductive material and mounted in the bucket or its vicinity so as to be visible to the operator of the boom.
 - t) Insulated measuring sticks shall be used to verify clearance distances.

507.6 Working on De-energized Lines and Equipment

- a) General: All conductors and equipment shall be treated as energized until isolated, tested and grounded.
- b) New Construction: New lines or equipment may be considered de-energized and worked as such under the following conditions:
 - (1) The lines or equipment are grounded, or
 - (2) The hazard of induced voltages is not present, and adequate clearances or other means are implemented to prevent contact with energized lines or equipment and the new lines or equipment.
- c) Communication Conductors: Bare-wire communication conductors on power poles or structures shall be treated as energized lines unless protected by insulating materials.
- d) Refer to Sections 507.13, Grounding—General, and 507.14, Equal Potential Grounding, for grounding procedures and requirements.

507.7 Series Street Lighting Circuits

- a) Before a series street lighting circuit is opened and work is performed thereon, one of the following procedures shall be performed:
 - (1) Circuit shall be disconnected from the source of supply by opening and physically rendering inoperative disconnecting switches or other absolute cutouts, to which Hold Cards shall be attached. Dependence shall not be placed on time switches or other automatic devices.
 - (2) Circuit shall be properly jumpered to avoid an open circuit condition.
- b) All series street lighting circuits shall be considered as energized and worked on in accordance with Sections 407, Use and Care of Rubber Gloves, 507.1, Working On or Near Exposed Energized Lines and Equipment, and 507.4, Working on Energized Lines with Live-Line Tools.

507.8 Working on Transformers

- a) The primary leads of a distribution transformer shall be considered energized at full voltage until both the primary and secondary leads have been disconnected or it has been definitely determined that the secondary circuit to which it is attached is grounded.
- b) *Non-current-carrying metal parts.*

Non-current-carrying metal parts of equipment or devices, such as transformer cases and circuit-breaker housings, shall be treated as energized at the highest voltage to which these parts are exposed, unless the employee inspects the installation and determines that these parts are grounded before employees begin performing the work.

- c) Employees shall not stand on or otherwise contact transformer cases while working on or near energized circuits.
- d) Employees shall refer to GVP policy for procedures on grounding substation transformers.

507.9 Hoisting Cables--Conductive Material

- a) Wire rope or other conductive material shall not be used to raise transformers, poles, or any other material near high voltage lines, except when the wire rope and any conductive material being raised are adequately protected by insulating covering, and such energized wires are properly covered.
- b) Use of wire rope as a hoist line shall be discontinued when it becomes worn, deteriorated, or damaged to a degree that is unsafe.
- c) Metallic slings (chain or cable) shall not be used near energized equipment.
- d) Positive control of wire rope shall be maintained at all times.
- e) Synthetic hoisting and pulling lines and ropes shall be considered conductive.

507.10 Working on Capacitors

- a) Line capacitors shall be considered at full voltage until they have been removed from the line and the terminals short-circuited and discharged to ground by an approved method. The terminals shall not be short-circuited until the capacitors have been de-energized for at least 5 minutes.
- b) Employees shall wear rubber gloves and use an approved 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.

507.11 Stringing or Removing De-energized Conductors

- a) Prior to stringing operations, a briefing shall be held setting forth the plan of operation and specifying the type of equipment to be used, grounding devices and procedures to be followed, crossover methods to be employed, and the clearance authorization required.
- b) If the conductor could accidentally contact an energized circuit or receive a dangerous induced voltage buildup, the conductor being installed or removed shall be grounded or provisions made to insulate or isolate the employee in order to further protect the employee from the hazard of the conductor.
- c) If the existing line is de-energized, proper clearance authorization shall be secured and the line grounded on both sides of the crossover, or the line being strung or removed shall be considered and worked as energized.
- d) When crossing over energized conductors in excess of 600 volts, rope nets or guard structures shall be installed unless provision is made to isolate or insulate the worker or the energized conductor. The automatic reclosing feature of the circuit interrupting device shall be made inoperative. In addition, a running ground shall be used on the line being strung or the line considered and worked as energized.

- e) Conductors being strung in or removed shall be kept under positive control by the use of adequate tension reels, guard structures, tielines, or other means to prevent accidental contact with energized circuits.
- f) A transmission clipping crew shall have a minimum of two structures clipped in between the crew and the conductor being sagged. When working on bare conductors, clipping and tying crews shall work between grounds at all times. The grounds shall remain intact until the conductors are clipped in, except on dead-end structures.
- g) Adequate grounds shall be placed on all dead-end structures and shall remain intact until jumpers are installed to complete the circuit, or shall be removed as the last phase of aerial cleanup.

507.12 Stringing Adjacent to Energized Lines

- a) Prior to stringing parallel to an existing energized transmission line, a competent determination shall be made to ascertain whether dangerous induced voltage buildups will occur, particularly during switching and ground fault conditions. If such dangerous induced voltage may exist, the provisions of Sections 507.13 b) through 507.13 j) shall be followed.
- b) When stringing adjacent to energized lines, the tension stringing method or other methods that preclude unintentional contact between the lines being pulled and any employee shall be used.
- c) All pulling and tensioning equipment shall be effectively grounded.
- d) A ground shall be installed between the tensioning reel setup and the first structure in order to ground each bare conductor, subconductor, and overhead ground conductor during stringing operations.
- e) During stringing operations, each bare conductor, subconductor, and overhead ground conductor shall be grounded at the first tower adjacent to both the tensioning and pulling setup, and in increments so that no point is more than 2 miles from a ground.
- f) The ground shall be left in place until conductor installation is completed.
- g) Such grounds shall be removed as the last phase of aerial cleanup.
- h) Except for moving type grounds, the grounds shall be placed and removed with a 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 equal potential.
 - (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 two way communications, through two-way radio or other equivalent means, shall be maintained during the entire pulling process. The tugger operator, reel tension operator and the person following the conductor as it is moving, shall be in contact with each other at all times.
- w) If two conductors are to be spliced, the conductor ends shall be bonded to each other and grounded before being spliced.
- x) While the conductor or pull line is being pulled into position, employees are not permitted directly under operations.

507.13 Grounding--General

- a) All previously energized conductors shall be considered energized until isolated, tested, and properly grounded.
- b) For new construction, see Section 507.6, Working on De-energized Lines and Equipment.
- c) Voltage Testing:
De-energized conductors and equipment, which are to be grounded, shall first be tested for the presence of nominal voltage.

- d) 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.
- e) Grounding: Equal potential grounding is required whenever possible. When equal potential grounding is not possible, dual point grounding (bracket grounding) is acceptable.
 - (1) 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.**
- f) 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.
- g) 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.
- h) Grounding Tower:

Grounding to tower shall be made with a tower clamp capable of conducting the anticipated fault current.
- i) 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.
- j) Lifting equipment, bucket and material handling trucks, digger/derricks line trucks, shall be bonded to an effective ground or considered energized and barricaded when used near energized equipment or lines. Employers may elect to barricade lifting equipment, bucket and material handling trucks, digger/derricks line trucks, instead of bonding to the best available ground. In either case, 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.
- k) Connecting and removing grounds.
 - 1) Order of connection.

The employer shall ensure that, when an employee attaches a ground to a line or to equipment, the employee attaches the ground-end connection first and then attaches the other end by means of a live-line tool. For lines or equipment operating at 600 volts or less, the employer may permit the employee to use insulating equipment other than a live-line tool if the employer ensures that the line or equipment is not energized at the time the ground is connected or if the employer can demonstrate that each employee is protected from hazards that may develop if the line or equipment is energized.
 - 2) Order of removal.

The employer shall ensure that, when an employee removes a ground, the employee removes the grounding device from the line or equipment using a live-line tool before he or she removes the grounded connection. For lines or

equipment operating at 600 volts or less, the employer may permit the employee to use insulating equipment other than a live-line tool if the employer ensures that the line or equipment is not energized at the time the ground is disconnected or if the employer can demonstrate that each employee is protected from hazards that may develop if the line or equipment is energized

- l) When work is performed on cable at a location remote from the cable terminal, the cable may not be grounded at the cable terminal if there is a possibility of hazardous transfer of potential should a fault occur.
- m) See OSHA Standard 29 CFR 1910.269(n) for more information on grounding.

507.14 Equal Potential Grounding

- a) A chain binder, with provisions for attaching a personal protective ground, shall be tightened around the pole at a position below where the lineman will place his feet.
- b) A personal protective ground shall be attached to the chain binder and extended to the system neutral. If the neutral is not present or cannot be approached safely, refer to Sections 507.13 h) and 507.13 i) for alternate grounding.
- c) Personal protective grounds shall be extended from the chain binder to a single phase, and from that phase to the other phases in a short circuit fashion.
- d) When work is completed, the personal protective grounds shall be removed in reverse order of installation.
- e) When a circuit is to be opened (e.g., opening jumpers at a junction pole or cutting slack), a temporary personal protective ground shall be installed across the open point.
- f) When it is not practical to use single-point grounding at the pole where work is to be performed, such as when wires are down, grounds shall be installed on both sides of the work location but not further than adjacent structures.

507.15 Pole 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 shall be safeguarded by red lights or well-lighted warning signs.
- c) Poles shall be so placed or blocked that they will not roll.
- d) Employees shall not remain on a pole pile while poles are being hoisted.
- e) Poles, loaded on a truck or trailer, shall be securely fastened every 10 feet to the truck or trailer, except on pole trailers. See the Federal Motor Carrier Safety Administration Drivers Handbook on Cargo Securement for more information.
- f) When a load of poles is within working distance of the ground, load binders shall be so installed that they can and will be operated by employees while standing on the ground.
- g) Employees shall not ride pole dollies or trailers.
- h) The wheels of the transporting vehicle shall be chocked and securely braked prior to loading or unloading.
- i) Utility poles, no matter what material composes them, must meet specifications laid out by ANSI. ANSI O5.1 classifies wooden utilities 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.

- j) Refer to Section 503.8, Hauling Poles or Ladders, for additional requirements on hauling poles and ladders. See the Federal Motor Carrier Safety Administration Drivers Handbook on Cargo Securement for more information.

507.16 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, peaveys, or slings are used.

Table 507-8. Western Red Cedar Total CCA Treatment Poles--Average Weights (Source: ANSI 05.1-2002)												
Length h (ft)	Class											
	H6	H5	H4	H3	H2	H1	1	2	3	4	5	6
30							762	666	581	501	442	383
35							970	828	739	640	564	495
40			1,993	1,822	1,702	1,544	1,191	1,049	904	789	703	627
45			2,393	2,185	1,990	1,871	1,426	1,250	1,092	950	851	
50		2,986	2,539	2,508	2,145	2,145	1,686	1,478	1,284	1,119	987	
55		3,484	3,214	2,940	2,686	2,451	1,954	1,709	1,485	1,313		
60	4,237	3,920	3,604	3,306	3,029	2,752	2,231	1,944	1,693	1,518		
65	4,847	4,484	4,142	3,818	3,389	3,089	2,511	2,195	1,912	1,709		
70	5,359	4,966	4,597	4,227	3,880	3,557	2,828	2,455	2,152	1,934		
75	5,890	5,471	5,075	4,679	4,283	3,937	3,099	2,742	2,742			
80	6,626	5,993	5,544	5,121	4,726	4,198	3,785	3,194	2,742			
85	7,210	6,706	6,058	5,610	5,161	4,600	4,023	3,524	3,033			
90	7,840	7,306	6,593	6,118	5,643	5,019	4,419	3,880	3,349			
95	8,560	7,995	7,432	6,709	6,207	5,488	4,967	4,310	3,726			
100	9,141	8,547	7,722	7,194	6,435	6,105	4,940	5,214	4,577			
105	9,840	9,184	8,349	7,762	6,963	6,782	6,600	5,669	5,029			
110	10,563	9,874	8,966	8,349	7,514	7,343	7,184	6,174	5,481			
115	11,309	10,599	9,639	8,956	8,072	7,953	7,844	6,679	5,933			
120	12,078	11,326	10,296	9,346	8,672	8,547	8,164	7,227				
Pounds												
Table 507-9. Creosoted Yellow Pine Poles--Average Weights (Source: ANSI 05.1-2002)												
Length h (ft)	Class											
	H6	H5	H4	H3	H2	H1	1	2	3	4	5	6
30												
35					2,222	1,884						
40					2,585	2,222						
45					2,976	2,585						
50					3,454	2,976						
55					4,015	3,454						
60					4,620	4,015						
65					5,198	4,620						
70					5,863	5,198						
75					6,590	6,130						
80					7,458	6,600	5,863	4,730	3,883			
85					8,019	7,458	6,600	5,264	4,296			
90					8,762	8,019	7,458	5,869	4,730			
Pounds												

Table 507-10. Douglas Fir Penta Treated Poles--Average Weights (Source: ANSI 05.1-2002)												
Length h (ft)	Class											
	H6	H5	H4	H3	H2	H1	1	2				
30							1,065	890	765	635	520	410
35							1,210	1,065	920	805	695	605
40							1,545	1,310	1,165	1,025	895	770
45				3,034	2,635	2,280	1,930	1,560	1,410	1,225	1,075	930
50	4,397	3,998	3,825	3,490	3,000	2,573	2,225	1,870	1,625	1,420	1,245	
55	4,270	4,872	4,354	3,998	3,514	2,995	2,480	2,130	1,845	1,600		
60	6,130	5,577	5,021	4,584	4,109	3,605	2,845	2,480	2,155	1,845		
65	6,888	6,274	5,659	5,136	4,608	4,075	3,330	2,810	2,380			
70	7,728	7,056	6,374	5,765	5,136	4,574	3,860	3,145	2,635			
75	8,568	7,905	7,046	6,322	5,650	5,006	4,320	3,515	3,015			
80	9,398	8,659	7,785	6,955	6,230	5,530	4,985	4,045	3,575			
85	10,325	9,465	8,520	7,622	6,840	6,082	5,480	4,385	3,640			
90	11,395	10,498	9,394	8,486	7,478	6,658	6,035	4,945	4,080			
95	12,345	11,362	10,214	9,115	8,136	7,272	6,600	5,985				
100	13,325	12,254	11,069	9,821	8,789	7,853	7,205	6,545				
105	14,352	13,214	11,875	10,680	9,518	8,520	7,900	7,070				
110	15,418	14,433	12,974	11,669	10,320	9,173	8,555	7,670				
115	16,526	15,149	13,589	12,341	11,069	9,821	9,180	8,438				
120	17,563	16,109	14,568	13,147	11,731	10,493	9,990	9,032				
125		17,045	15,509	13,910	12,614	11,218	10,746					
	Pounds											

- (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 if needed.
- 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. The use

of sufficient lifting capacity, and/or loosening the earth around the pole along its entire depth, shall be considered.

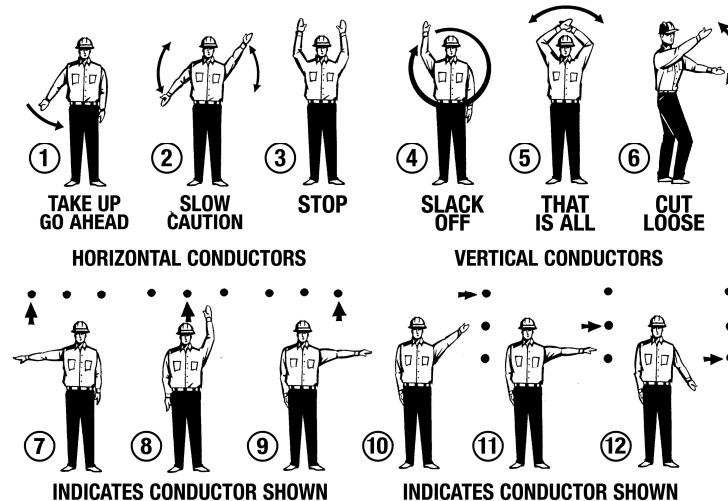
l) Hoisting equipment operators shall accept signals only from the employee specifically designated. The signal person shall be properly qualified to signal hoisting operations. The operator shall obey the stop signal given by anyone. Refer to Figures 507-1 and 507-2 for standard line work and hoist operation signals.

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.

m) Please see Section 503.10, Cranes, Derricks, Hoisting Equipment, for more information.

Figure 507-1. Suggested Standard Signals for Line Work



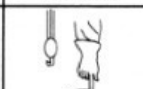
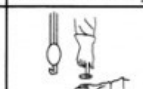
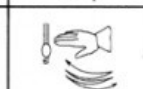
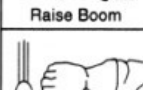
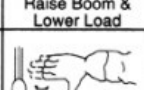
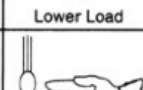
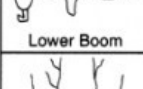
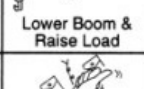
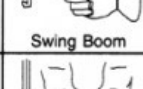
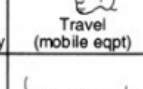
Signal 1 is used to indicate the start of the pull (take up) or the continuation of the pull (go ahead). Faster or slower motions of this signal are used to indicate speeds other than caution or slow speeds. Where there is a choice of conductors to be pulled, this signal is given with one of the indicating 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.

Figure 507-2. Truck Hoist Signals

 Main Hoist	 Auxiliary Hoist	 Hoist Load	 Hoist Load Slowly	 Stop
 Raise Boom	 Raise Boom & Lower Load	 Lower Load	 Lower Load Slowly	 Emergency Stop
 Lower Boom	 Lower Boom & Raise Load	 Swing Boom	 Swing Boom Slowly	 Travel (mobile eqpt)
 Retract Boom 2 hands	 Retract Boom 1 hand	 Extend Boom 2 hands	 Extend Boom 1 hand	 Dog Everything

507.17 Derrick Trucks, Cranes, etc.

Refer to Section 503.10, Cranes, Derricks, Hoisting Equipment.

507.18 Fuses

When fuses must be installed or removed with one or both terminals energized at more than 300 volts, or with exposed parts energized at more than 50 volts, tools or gloves rated for the voltage shall be used. When installing expulsion type fuses, employees shall wear safety glasses or safety goggles and shall stand clear of the exhaust path of the fuse barrel.

507.19 Rope

- A rope shall not be overloaded or dragged over rough or sharp objects.
- Short bends over sharp edged surfaces should be avoided.
- Kinks shall be removed before any strain is put on a rope.
- When not in use, rope shall be dried, stored properly, and kept free from mechanical damage and excessive heat and dryness.
- 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.
- The outward appearance of rope shall not be accepted as proof of quality or strength.
- The safe loads shall not be exceeded.
- Hand lines shall be a minimum of 1/2 inch diameter line or have a minimum diameter of breaking strength of 5,000 lbs.

507.20 Substations

- a) For information concerning substations, refer to Section 512, Substations, and OSHA Standard 29 CFR 1910.269.
- b) For more specific information on guarding of rooms containing electrical supply equipment and guarding of energized parts, refer to OSHA Standard 29 CFR 1910.269 (u) (4) and (5).

507.21 Metering

- a) Appropriate clothing and PPE shall be worn when installing or removing meters from energized meter sockets and meter sockets equipped with bypass capabilities. Refer to Part 4, Personal Protective Equipment, for specific requirements.
- 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) When approaching or working on customer property, employees shall watch for tripping hazards; defective stairs; and the presence of dogs, cats, or other potentially dangerous animals.
- m) Before entering customer property, employees shall announce their presence and state their business if practical. Employees shall also notify the customer when leaving the property if practical.
- n) If safety conditions dictate, employees shall turn off customer main switch prior to installing and removing socket type meters.
- o) Employees shall push socket-type meters into their socket. Employees shall never hit the meter with their hand or any device.

507.22 Testing and Test Facilities

This section applies to testing involving interim measurements utilizing high voltage (1000 volts or more), high power, or combinations of both, not to testing involving continuous measurements as in routine metering, relaying or normal line work.

- a) Employees shall be trained in safe work practices upon their initial assignment to the test area.
- b) Permanent test areas shall be guarded by walls, fences, or barriers designed to keep employees out of the test areas.
- c) In field testing, or at a temporary site where permanent fences or gates are not provided, one of the following means shall be used to prevent unauthorized employees from entering:
 - (1) The test area shall be guarded by the use of distinctively colored safety tape that is supported waist high and to which safety signs are attached.
 - (2) The test area shall be guarded by a barrier or barricade that limits access to the area.
 - (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.

507.23 Hazardous Energy Control

Refer to Section 202, Hazardous Energy Control (Lockout/Tagout) Procedures.

Note: Also refer to GVP-specific hazardous energy control and switching procedures.

508 Tree Trimming

508.1 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) The qualified arborist or line clearance tree trimmer in charge shall perform a job briefing before the start of each job. The briefing shall be communicated to all affected workers. (For more information, refer to ANSI 4.1.3.)
- b) Chain saw-resistant foot/leg protection shall be worn by employees while operating a chain saw during ground operations. (For more information, refer to ANSI 133 4.2.8.) This section will be reviewed in GVP's PPE assessment in late 2014.
- 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.

508.2 Tree Trimmer Training

- a) Each 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, and
 - (3) The minimum approach distances specified in this section corresponding to the voltages to which the employee will be exposed and the skills and techniques necessary to maintain those distances.

508.3 Working Near Energized Conductors

Note: The instructions below do not apply to electric power generation, transmission, and distribution qualified employees.

- a) Before any employee climbs, enters, or works around any tree, a close inspection shall be made to determine whether an electric conductor passes within 10 feet of the tree.
- b) Wires in proximity to tree trimming shall be considered as energized, unless proven to be dead and grounded.
- c) All employees involved with tree trimming, other than line clearance tree trimmers, shall maintain the following minimum clearances from energized conductors and equipment (numbers expressed are phase-to-ground):
 - (1) For lines and equipment energized at 50 kV or less, the minimum clearance distance is 10 feet.
 - (2) For lines and equipment energized at more than 50 kV, the minimum clearance distance is 10 feet plus 4 inches for every 10 kV over 50 kV.
- d) Only line clearance tree trimmers shall perform tree trimming if an electrical hazard exists or if parts of the trees are within 10 feet of exposed energized overhead conductors or equipment.
- e) A second line clearance tree trimmer shall be within normal voice communication and have climbing gear within 50 feet of the work area if any of the following conditions exist:
 - (1) If a line clearance tree trimmer is to approach closer than 10 feet to any conductor or electrical apparatus energized at more than 750 volts.
 - (2) If branches or limbs being removed are closer to lines energized at more than 750 volts or are within the distances listed in GVP AC Live Line-MAD Table (page 97).
 - (3) If roping is necessary to remove branches or limbs from energized conductors or apparatus at more than 750 volts.
- f) Line clearance tree trimmers shall maintain clearances from energized conductors as shown in GVP AC Live Line-MAD Table (page 97).
- g) Line clearance tree trimmers shall use insulating equipment and rubber gloves when removing branches that are contacting exposed energized conductors or equipment or that are within the distances (or have the potential to become within the distances) specified in GVP AC Live Line-MAD Table (page 97). Limbs being removed from contact with wires are to be handled with the same precautions as the wires themselves. Care shall be taken to prevent limbs being removed from coming in contact with tree trimmer's body.
- h) Ladders, platforms, aerial lifts, tools, and equipment shall not be brought closer to an energized conductor or apparatus than the distances listed in GVP AC Live Line-MAD Table (page 97).
- i) Tree trimming and tree felling work should terminate and employees should move to a place of safety during electrical storms and periods of high winds or other unusual weather conditions that are dangerous to employees.
- j) Employees shall not remove tree limbs or branches from above energized conductors while other employees are working in trees below the conductors in the same span.
- k) Broken or fallen wires shall not be handled except by persons experienced in such work.
- l) When working near wires, the employee shall have their climbing rope so secured that, in the event they slip or a limb breaks, they will swing free and clear of the wires.
- m) Tree limbs shall not be dropped on conductors.

- n) Ropes shall not be thrown over conductors or cross-arms for the purpose of using the conductor or cross-arm as a support or hitch.
- o) Dry ropes shall be used in trees through which energized conductors pass.
- p) Each 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, and
 - (3) The minimum approach distances specified in this section corresponding to the voltages to which the employee will be exposed and the skills and techniques necessary to maintain those distances.
- q) For additional information concerning working near energized conductors, refer to OSHA Standard 29 CFR 1910.269.

508.4 Tree Felling

- a) The employee felling the tree shall plan a clear retreat path before a cut is started.
- b) The feller shall appraise the situation for dead limbs, the lean of the tree to be cut, wind conditions and other hazards, and exercise proper precautions before the cut is started.
- c) When felling a tree, an undercut shall be made about 1/3 the diameter of the tree to guide the tree in the direction to fall and reduce the possibility of splitting. A back or felling cut shall be made parallel to the inner edge of the undercut and approximately 2 inches higher than the undercut.
- d) The feller shall shut off his saw before he starts his retreat.
- e) On terrain where trees are likely to slide or roll, fellers shall fell trees from the uphill side.
- f) No one shall be allowed to work in a tree located near a tree that is being felled if there is any danger of its being struck by any part of the falling tree. The recommended distance between workers is twice the height of the trees being felled.
- g) All persons not engaged in the felling operation shall be kept clear of guide ropes and other rigging.
- h) Clear warning shall be given to all employees in the area when trees are to be felled or heavy tree members are to be dropped.
- i) Once the felling of a tree has been started, it shall be completed before leaving the job.
- j) For additional information concerning tree felling, refer to OSHA Standard 29 CFR 1910.266.

508.5 Care and Use of Tools and Rope

- a) Ropes shall be inspected at least daily and before each use. Damaged sections shall be cut out and destroyed or the rope replaced.
- b) Ropes shall be kept away from fire, acids, oil, chemicals, and all sources of excessive heat.
- c) Dragging ropes over rough surfaces and sharp objects, such as rocks, shall be avoided. Ropes shall be stored separately from sharp-edged cutting tools.
- d) The cutting edge of tools shall be suitably sheathed or guarded except while in actual use. Cutting tools shall be kept sharp and properly shaped.
- e) When not in actual use, the trimmer's saw shall be returned to the scabbard.
- f) Axes shall not be used in trees or carried on the shoulder.
- g) Tools shall not be thrown into or dropped from a tree; they shall be raised or lowered by a suitable rope line.

- h) A pruner shall not be laid on a limb or in a crotch, or hooked on a wire or rope. It shall be hooked over a limb strong enough to hold its weight.
- i) Ladders shall be removed from the base of the tree when not in use.
- j) Climbing ropes shall have a minimum diameter of 0.5 inch (1.2 cm) with a minimum breaking strength of 2,300 lbs (10.2 kN). Synthetic rope shall have an elasticity of not more than 7 percent.
- 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.

508.6 Powered Trimming Equipment

- a) Employees operating powered trimming equipment shall wear suitable eye and face protection.
- b) For hearing protection requirements, refer to Section 306, Noise, and Section 404, Hearing Conservation.
- c) 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.
- d) Chainsaw operators shall follow manufacturer's instructions on operation and maintenance.
- e) 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 or no supporting limbs are available.
- f) When starting a chainsaw, it shall be placed on or against a solid support and the area cleared of all co-workers.
- g) The operator shall grip the chainsaw with both hands during the entire cutting operation.
- h) The saw bumper shall be against tree or limb before starting a cut.
- i) Chainsaw operators shall, when necessary, clear the immediate area around their work to make certain that brush will not interfere with either the chainsaw or operator.
- j) All chainsaws shall be equipped with "deadman" controls, so the control cannot lock in "on" position.
- k) The chainsaw engine or motor shall be stopped for the following:
 - (1) When working on any part of the chain or cutting bar.
 - (2) While the saw is being moved from one location to another, including being carried up into the tree.
 - (3) While unit is unattended.
- l) A gasoline driven chainsaw engine shall be stopped when being refueled. If gas is spilled on the chainsaw during refueling, it shall be wiped off before the engine is started. Chainsaws shall not be started within 10 feet of a fueling area.
- m) A gasoline driven chainsaw shall not be used above shoulder level or at a distance that would require the operator to relinquish a safe grip on the saw.
- n) Employees shall not approach a chainsaw operator within the reach of the saw while the saw is in operation.
- o) An employee shall never hand a pneumatic or hydraulic pruner or saw to another employee unless it is disconnected.

- p) Powered tools shall not be left unattended if connected to a power source.
- q) Powered tools shall not be adjusted or repaired while connected to power source.
- r) 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.
- s) 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.
- t) For additional information concerning power trimming equipment, refer to OSHA Standard 29 CFR 1910.266.

508.7 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) Full cover goggles or face shield shall be worn by an employee when feeding brush into the chipper.
- 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) For hearing protection requirements, refer to Section 306.
- i) Only wrist-length (nongauntlet) gloves shall be used by employees feeding a chipper.
- j) Trailer chippers detached from trucks shall have their wheels chocked.
- k) Brush chippers shall be equipped with a locking device in the ignition system.
- l) For additional information on chippers, refer to OSHA Standard 29 CFR 1910.269.

508.8 Right-of-Way Clearing and Maintenance

- a) When two or more employees are cutting brush, they shall be separated by at least 10 feet.
- b) Under no circumstances shall anyone except the operator ride on a bulldozer, or any other heavy equipment used in land clearing.
- c) Bulldozer operators shall wear seat belts, if the bulldozer is equipped with rollover protection.
- d) Employees shall not anchor equipment to railroad tracks, fences, or structures belonging to others.
- e) When emerging from the right-of-way, prior to road travel, employees shall test brakes.

509 Underground Lines and Equipment

509.1 Opening and Guarding Holes

Whenever a cover is to be removed from a manhole or a vault, or any other obstruction to traffic exists, the following precautions shall be taken:

- (1) All obstructions to traffic shall be guarded by adequate signs, barricades, lights, flags, etc. Traffic shall be warned in sufficient time that an obstruction exists through the use of signs, high level standards, flashing lights, traffic cones, flagmen, etc., as may be needed.
- (2) Where permissible and practicable, the truck shall also be placed to guard the work area against oncoming traffic.
- (3) A blow torch or other open flame shall never be used to melt ice around a manhole or vault cover.
- (4) Manhole, vault, and service box covers shall always be removed and replaced by means of approved hooks or hoists.

509.2 Entering Underground Structures

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

- (1) Contains or has a potential to contain a hazardous atmosphere(s).
- (2) Contains a material that has the potential for engulfing an entrant.
- (3) Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross section.
- (4) Contains any other recognized serious safety or health hazard.

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

- a) Before an employee enters a street opening, such as a manhole or vault, it shall be promptly protected with a barrier, temporary cover, or other suitable guard.
- b) When work is to be performed in a manhole or vault, observe the following:
 - (1) No entry shall be permitted unless forced ventilation is used, or the atmosphere is found to be safe by testing for oxygen deficiency and the presence of toxic, explosive gases or fumes.
 - (2) When unsafe conditions are detected by testing or other means, the work area shall be ventilated and otherwise made safe before entry.
 - (3) Provisions shall be made for an adequate continuous supply of clean air.
- c) If in an emergency it becomes necessary for an employee to enter a manhole or vault with a hazardous atmosphere, the employee shall use an approved airline respirator or self-contained breathing apparatus and a body harness attached to a lifeline monitored by an attendant stationed at the manhole or vault opening. Refer to Section 201, Confined or Enclosed Spaces, for additional confined or enclosed space requirements.
- d) A ladder shall always be used in entering or leaving a manhole or vault. Climbing into or out of manholes or vaults by stepping on cables or hangers is forbidden.
- e) While work is being performed in manholes (enclosed spaces), a qualified employee trained in first aid and CPR shall be available in the immediate vicinity to render emergency assistance if required. This requirement shall not preclude the employee in the immediate vicinity

from occasionally entering a manhole to provide assistance other than emergency. This requirement does not preclude a qualified employee, working alone, from entering for brief periods of time a manhole where energized cables or equipment are in service for the purpose of inspection, housekeeping, taking readings, or similar work if such work can be performed safely.

f) Before any work is done on a cable, it shall be identified by an approved method. If there is any doubt as to the identification, work shall not be started until it is checked and identified by the proper authority.

g) Where cables in manholes appear defective by the presence of abnormalities that could lead to or be an indication of an impending fault (such as oil or compound leaking from cable or joints, broken cable sheaths or joint sleeves, hot localized surface temperatures of cables or joints, or swollen joints whose circumference exceeds 3.5 times the standard sleeve size diameter), no employee may work in the manhole while the defective cable is energized. However, if the defective cable or splice cannot be de-energized because of service load conditions, employees may enter the manhole provided they are protected from the possible effects of a failure by shields or other devices that are capable of containing the adverse effects of a fault in the joint.

h) For additional requirements concerning confined or enclosed spaces, refer to Section 201, Confined or Enclosed Spaces.

509.3 Work on Energized Cables

a) **At least two employees will be present while the following types of work are being performed (except as noted in c) below):**

(1) Installation, repair or removal of de-energized 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 lifts, near parts energized at more than 600 volts.

(5) Any other work that exposes an employee to electrical hazards greater than or equal to those listed above.

b) **Two employees do not need to be present in the following conditions:**

(1) Routine switching of circuits (if it can be done safely).

(2) Work performed with live-line tools if the employee is positioned so that they are not within reach of or otherwise exposed to energized parts.

(3) Emergency repairs necessary to safeguard the general public. Only qualified employees may work on or with exposed energized cables or parts of equipment.

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.

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

- c) No employee may approach or take any conductive object without an insulating handle closer to exposed energized parts than the clearances set forth in GVP AC Live Line-MAD Table (page 97) and 507-5 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. Refer to Sections 507.2, Flexible Protective Equipment, 507.5, Working on Transformers, and 509.5, Working on De-energized Cables, for related information. Refer to OSHA Standard 29 CFR 1910.137.
- d) Only qualified employees and trainees working under their direct supervision may work on or with exposed energized 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 (refer to Part 4, Personal Protective Equipment).
- m) Before cutting into an energized supply cable, the operating voltage shall be determined and appropriate precautions taken for handling conductors at that voltage.
- n) Repair to cables shall be in accordance with the cable manufacturer's specifications.
- o) When removing a section of sheath or sleeve on an energized cable that contains lead, refer to Section 313, Lead. 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.

All GVP employees involved in the disturbance of lead-containing materials or lead based paint as part of regular work activities should have at least a lead awareness training class and have blood lead levels checked initially, then at least annually thereafter.
- p) For more information regarding the OSHA lead standard, refer to 29 CFR 1910.1025 or IEEE's National Electrical Safety Code C2-2012, Section 443.

509.4 Work on Energized Equipment

Proper PPE shall be worn when work is performed on any energized URD cable or apparatus. For more information, refer to Part 4, Personal Protective Equipment.

- a) When work is performed on cables or apparatus carrying less than 600 volts, employees shall take extra precautions in the use of necessary rubber protective equipment, in observing adequate clearances, and in using proper tools in order to prevent short circuits.
- b) When working with energized conductors of 50 V or greater, employees shall wear rubber gloves of the appropriate class rating.
- c) 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.
- d) A primary or secondary system neutral on any energized circuit shall not be opened under any circumstances.
- e) 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 (refer to Part 4, Personal Protective Equipment).
- f) 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.
- g) 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.
- h) 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.
- i) 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. See Part 4, Personal Protective Equipment, and Section 406, Clothing, of this *Manual*.

509.5 Work on De-energized Cables

- a) When cables and apparatus are taken out of service to be worked on, the procedure outlined in Section 507.6, Working on 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 is to be cut, a short section of the shielding, if any, completely around the cable shall be removed and tests made with two approved testing devices to determine whether the cable is de-energized. If no indication of a live cable is obtained, the employee may proceed with the work.
- d) When opening a joint or splice in a high voltage cable, the sleeve of the joint shall be cut completely around near the wipes and then cut lengthwise and removed from the joint. No effort shall be made to remove the compound. The employee shall then test over each conductor with two approved testing devices. If no indication of a live cable is obtained, the employee shall remove the compound. If shielding tape is then encountered, it shall be removed and another test made over each conductor with two approved testing devices. If no indication of a live cable is then obtained, the employee shall pierce 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.

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

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

509.6 Opening and Closing Circuits

- a) Grand Valley Power 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.

509.7 Grounding

Note: A capacitance charge can remain in a URD cable after it has been disconnected from the circuit, and a static type arc can occur when grounds are applied to such cables.

- a) All URD cables and equipment, including services that have been energized or could become energized from any source shall be considered as energized until the equipment is tested and has been grounded.
- b) Before working on de-energized primary circuits or equipment:
 - (1) A visible open break shall be provided;
 - (2) A voltage test shall be made; and
 - (3) The equipment shall be grounded.
- c) When work is to be done on equipment or cables of an underground system, precautions to prevent backfeed shall be taken, including grounding of secondary conductors.
- d) De-energized cables to be worked on shall be grounded at a point as close to the work as possible.
- e) All underground cables and apparatus carrying current at voltages greater than 600 volts shall be de-energized and grounded before cables are cut into or spliced.
- f) All conductors of a circuit shall be de-energized when work is to be performed on any of them.
- g) Ground lead shall be capable of conducting the anticipated fault current and shall have a minimum conductance of No. 2 AWG copper.

509.8 Heating Materials

- a) Metals and insulating compounds shall be heated in such a manner as to prevent hazard to the employees working in manholes or vaults and to vehicular or pedestrian traffic.
- b) Gloves, sleeves, and safety glasses shall be worn while heating or working with hot insulating compound or metals.
- c) Furnaces and tanks containing liquefied petroleum gas such as butane or propane shall not be placed in a manhole or vault.
- d) Cold solder scraps or dipper shall never be placed in a hot solder pot until the chill and any moisture have been removed from the scraps or dipper.
- e) Heating pots for solder, oil, or compound shall be safely positioned so that the contents cannot enter the vault or manhole in the event of spillage.
- f) Lighted furnaces or blow torches should not be left unattended.
- g) Torches or furnaces must be kept at a safe distance from flammable materials.

509.9 Rubber Glove Use

- a) **In the event there is a suspected problem outage or physical damage to equipment, rubber gloves for appropriate voltage shall be put on before any energized URD compartment or enclosure (including service pedestal) is opened and kept on until the compartment or enclosure is closed and locked or until all equipment is properly grounded, barricaded, and shielded.**

- b) Rubber gloves shall be worn when removing animals, vines, weeds, grass, or vegetation of any kind that has grown into an energized URD installation whether the equipment is opened or closed.
- c) Rubber gloves shall be worn when energized primary cables are moved, handled, or protected.
- d) Rubber gloves shall be worn when work is performed on energized secondaries and services.
- e) Rubber gloves shall be worn when working on or contacting a neutral.
- f) Rubber sleeves should be used with rubber gloves when working on URD.
- g) Refer to Section 407, Use and Care of Rubber Gloves, for additional rubber glove requirements.

509.10 Excavations

Note: This section applies to all excavation work, not just URD operations.

- a) Before opening an excavation, all interferences such as trees, sidewalks, and foundations shall be removed or supported as necessary to protect employees and the public.
- b) The estimated location of GVP and other underground installations that may be encountered during excavation work shall be determined before opening the excavation.
- c) When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means, usually by hand digging with an insulated shovel and the use of suitable gloves.
- d) If electric cables are damaged, the following steps shall be taken:
 - (1) If the damaged cable belongs to a utility other than the one performing the work, this utility shall be notified at once.
 - (2) The area shall be barricaded and the public kept out until hazardous conditions can be eliminated.
- e) If gas lines are damaged, the following steps shall be taken as soon as possible:
 - (1) The hole shall be left open to allow the gas to dissipate into the atmosphere. All possible sources of igniting the gas shall be removed or eliminated.
 - (2) Residents of the area shall be warned when necessary, and the public kept out of the area.
 - (3) The local fire department shall be notified immediately.
 - (4) The gas company shall be notified at once.
 - (5) The local police department shall be notified.
- f) If communication cables are damaged, the communication company shall be notified at once.
- g) While the excavation is open, underground installations shall be protected, supported, or removed to safeguard employees.
- h) A stairway, ladder, ramp, or other safe means of egress shall be located in trench excavations that are 4 feet or more in depth so as to require no more than 25 feet of lateral travel for employees.
- i) Employees exposed to vehicular traffic shall wear high visibility retroreflective vests or other suitable garments.

- j) No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials.
- k) When mobile equipment is operated adjacent to an excavation and the operator does not have a clear and direct view of the edge of the excavation, a warning system such as barricades, a spotter, or stop logs shall be utilized. If possible, the grade should be away from the excavation.
- l) Employees shall not work in excavations in which there is accumulated water or in excavations in which water is accumulating unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a body harness and lifeline.
- m) If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation.
- n) Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided.
- o) Employees shall be protected from excavated material or equipment that could fall or roll into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet from the edge of excavations or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into the excavation.
- p) Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted before starting work and as needed throughout the shift. Inspections shall also be made after every rainstorm. Where the competent person finds evidence of a situation that could result in a possible cave-in, failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.
- q) Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.
- r) When excavations are left open, warning, devices, barricades, or guardrails shall be placed to adequately protect the public and employees.
- s) At the end of each workday, as much of the excavation as practical shall be closed. No more trench shall be open at one time than is necessary.
- t) Mechanical excavating equipment that is parked or operating on streets or highways shall be protected by proper warning devices.
- u) When it is necessary to leave excavating equipment unattended, the blade, bucket, or scoop shall be lowered to the ground and the ignition system locked.
- v) Each employee in an excavation shall be protected from cave-ins by an adequate protective system, either sloping or benching, or by a shoring or shield system, unless excavations are made entirely in stable rock or are less than 5 feet in depth and examination of the ground by a competent person provides no indication of a potential cave-in.

- w) When choosing a protective system, a competent person shall take into consideration soil type, vibration sources, previously disturbed soil, layered soil, presence of water, heavy equipment work adjacent to the excavation, limited work area, and other hazard-increasing conditions.
- x) Shoring and shield systems shall be installed and removed in a manner that protects employees from cave-ins, structural collapses, or from being struck by members of the shoring or shield system.
- y) Removal of shoring systems shall begin at and progress from the bottom of the excavation. Members shall be released slowly so as to note any indication of possible cave-ins of the side of the excavation or possible failure of the remaining members.
- z) Shields shall be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of a sudden lateral load.
- aa) Employees shall be protected from the hazards of cave-ins when entering or exiting the areas protected by shields.
- bb) Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.
- cc) Sloping or benching, shoring or shielding for excavations greater than 20 feet deep shall be designed by a registered professional engineer. Refer to Table 508-1 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.
- ee) For additional information on excavation requirements, refer to OSHA Standard 29 CFR 1926, Subpart P, Excavations.

Table 508-1. Maximum Allowable Slopes for Excavations Less Than 20 Feet Deep¹	
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°)

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 on 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°).

509.11 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 as stated in Section 509.10, Excavations.
- g) For appropriate work area protection, refer to Section 505, Work Zone Safety (Traffic Control).
- h) Location of Underground Facilities:
 - (1) The person in charge shall contact a one-call service and request the location of underground utilities and other services prior to starting boring operations. If a one-call service is not available, each individual Utility shall be contacted.
 - (2) The person in charge shall conduct a visual inspection of the jobsite looking for conditions that indicate there may be buried utilities or other obstructions in the bore path. Conditions may include: buried utility notices, utility using facilities without overhead

lines, gas or water meters, junction boxes, drop boxes, pad-mounted transformers, light poles, manhole covers, sunken ground, or any other irregularity that may indicate previous trenching.

(3) The person in charge shall check to see that all utilities marked by other organizations look reasonable and that none appear to be overlooked. If locating equipment is available, spot checks of the locations flagged by others shall be made. If there is a doubt as to the location of a buried utility, the utility should be hand excavated to determine the exact location.

(4) One or more of the following boring methods shall be used when operations are within 10 feet of a utility; when practicable, all three should be used:

(a) Expose the Utility along the bore path by careful hand digging or soft excavating.

(b) Have the Utility shut down during the boring operation, and upon completion, tested prior to turning on the service to ensure the utility has not been damaged during the operation.

(c) Use a steerable, tracked boring system and electrical strike system.

i) During premobilization inspection, employees shall:

(1) Check electronics before leaving the facility and follow manufacturer's instructions regarding calibration.

(2) Replace missing or damaged safety shields and safety signs.

(3) Inspect boring machine and check all fluid levels before leaving the facility. Look for loose chains, hydraulic leaks, fuel leaks, trailer tires, etc. Make sure all safety equipment is tested and available for use.

(4) Check trailer connections--safety chains, electrical connections, electric breakaway, trailer hitch, trailer brakes, and chain binders on boring machine.

(5) Before transporting equipment to the jobsite, inspect the site and note the overall grade or slope, including hills, ditches, and trenches. Consider the size of the area needed to set up the directional boring equipment. Also note any obstacles such as buildings, railroad tracks, and bodies of water.

j) Transportation:

(1) Employees shall find a safe place to park the truck and trailer and shall observe all safety rules regarding traffic control and other warnings for motorists and pedestrians.

(2) If the bore is near a road or other traffic, the appropriate federal, state, and local government agencies shall be contacted to determine the safety precautions and regulations to be observed. Appropriate traffic control shall be maintained as required.

k) Setup:

- (1) The directional boring machine shall be firmly anchored on a level boring surface. If a level boring surface is not practicable, the directional boring machine shall be set up with the rod stack on the uphill side.
 - (2) Consideration shall be given to existing underground utilities or other obstructions when stacking the boring machine.
 - (3) All boring equipment shall be properly barricaded, as required, to keep spectators away.
 - (4) Pressurizing the drill string shall be preceded by a check that all connections are tight and all hoses and pipes are in good condition.
 - (5) Employees shall know telephone numbers of and have means to communicate with local emergency medical facilities.
 - (6) Applicable personal protective equipment, including but not limited to, hardhats, safety glasses, dielectric boots and dielectric gloves rated for the voltages involved, shall be worn by employees.
- l) Bore Operations:
- (1) Supervisors shall review jobsite hazards, safety and emergency procedures, and individual responsibilities with all personnel before work begins.
 - (2) Employees shall know the right-of-way and depth tolerances and take into account the backreamer diameter when planning the bore path.
 - (3) Employees shall use appropriate manufacturer recommended tools to tighten drill housings, backreamers, etc. Pipe wrenches, which can slip and fly off the rod causing serious injury, shall not be used.
 - (4) The drill string shall never be rotated when a wrench is attached to the pipe. Automated wrenches shall be used when possible.
 - (5) When backreaming and pulling in product, employees shall use extreme caution to keep loose clothing from becoming entangled.
 - (6) Railroad track signals, traffic signal loops, high voltage power lines, and other sources can affect electronic locator operation. Employees shall identify and resolve interferences before starting boring operations.
 - (7) While drilling and backreaming, employees shall make sure good water flow exists. Fluid cools the head electronics and reduces the amount of force required to bore.
 - (8) Employees shall lubricate drill pipe threads and keep threads free of dirt and debris.
 - (9) Employees shall inspect drill pipe for signs of damage, wear, or fatigue, and replace damaged or worn pipe before a break occurs.
 - (10) Locating, removing head, installing backreamer, pullback process, and hooking up service all require good communication. Radios or other effective means of communication shall be used.
 - (11) Cold weather has an effect on boring machinery and electronics. Employees shall follow manufacturer's requirements when boring in cold conditions.
 - (12) Employees operating the boring machine shall stop and investigate any sudden change in boring rate or anything that "doesn't feel right."
- m) Electrical Strike Protection:
- (1) Dielectric hightop boots and gloves rated for the voltages involved shall be worn at all times by the boring crew and locator to reduce the probability of injury. Pantlegs shall be tucked on the inside of electrically insulated boots.

- (2) Electrically insulated sleeves shall be used when energized parts are not insulated from the employee or when employee's upper arms are exposed.
- (3) Employees shall never bore near any power source in excess of the rating of the dielectric boots and gloves they are wearing.
- (4) Leather protectors shall always be worn over insulating gloves to provide protection.
- (5) As an added precaution, the locator shall stand 10 feet to the side of the bore path while the bore is progressing.
- (6) When the directional boring machine requires ground contact by employees to operate, a grid system of wire mesh mats that is electrically bonded to the drill unit, and appropriately covers the working areas of the operator and assistants, shall be used in accordance with the manufacturer's specifications.
- (7) Barriers should be placed at least 6 feet away from all equipment that is electrically bonded. This shall include directional boring equipment, truck, trailer, entrance trench, exit trench, and bore path.
- (8) A ground rod shall be driven and securely connected to the boring machine by a heavy-duty cable. If feasible, the ground rod shall be driven at least 6 feet away from the boring machine.
- (9) If the boring machine is equipped with a voltage limiter, the voltage stake shall be placed at least 6 feet away and must not touch any other part of the equipment.
- (10) Dielectric hightop boots and gloves rated for the voltages involved shall be worn by employees while installing grounding rods and voltage stakes.
- (11) Sledgehammers shall not be used to install ground rods or voltage stakes; approved rod drivers shall be used.
- (12) Each directional boring machine should have a strike detection system that includes a voltage stake, voltage limiter, and an electrical strike indicator. The electrical strike indicator should consist of dual detection sensors, reset feature and self-test circuit.
- (13) Electronic strike sensing systems shall be tested prior to each use.
- (14) All portions of the boring system shall be electrically bonded to reduce the likelihood of their damage from high voltage differentials.

n) Procedure in Event of an Electrical Strike:

Note: The following are guidelines; the specific equipment manufacturer's instructions shall be followed.

- (1) A strike sensing system 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 GVP has shut down electricity to the area.
- (2) The operator shall warn the locator and bystanders to stay away.
- (3) For directional boring machines with both test and reset capabilities, the following procedures shall be used:
 - (a) Do not step off the machine or grid mats and do not allow anyone to approach the work area.
 - (b) Move the drill head or backreamer away from the contact in hopes of disengaging it from the power source.

- (c) Do not attempt to add or remove joints from the drill string. Breaking off the drill string can result in a lethal touch potential between it and the rest of the drilling unit.
- (d) Attempt to reset the strike sensing control box. If it resets, go through its operational test. This verifies the current and voltage sensing circuits were not damaged during the strike.
- (e) If the alarms continue after resetting, the drill string probably remains in contact with the power cable.
- (f) Verify GVP's automatic breaker settings. Wait for GVP'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 utility. Employees shall not resume work without the power company's permission.
- (g) If one cannot be sure the boring unit is no longer energized, have a person outside of the work area contact the proper utility to shut off the line before anyone moves from their position.

o) Procedure in the Event of a Gas Line Strike:

No warning system tells directional boring crews that a gas line has been struck. Usually, the only indicator is the odor or sound of leaking gas. If a natural gas line is struck, use the following procedures:

- (1) Remove all equipment from dig area and 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.**

p) Procedure in the Event of a Fiber-Optic Strike:

- (1) Warn people nearby that a strike has occurred.
- (2) Contact emergency personnel.
- (3) Contact the utility.
- (4) Do not look into the ends of fiber-optic or unidentified cable. Vision damage can occur.
- (5) Do not resume work until given permission by the utility.

509.12 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.

509.13 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.

509.14 Hazardous Energy Control – Lockout/Tagout

Refer to Section 202, Hazardous Energy Control (Lockout/Tagout) Procedures.

Note: Also refer to GVP-specific hazardous energy control and switching procedures.

511 Communication Facilities

511.1 Fiber-Optic Systems

- a) Employees shall be properly trained on the specific hazards of handling fiber-optic cable and equipment.
- b) Under normal operating conditions, lightwave transmission systems are completely enclosed. The following precautions shall be observed with these systems:
 - (1) Employees shall not disconnect any fiber-optic cable or splice and stare into the optical connectors terminating the cables because of the potential for eye damage.
 - (2) Under no circumstances should an employee who has not satisfactorily completed an approved training course perform lightwave/fiber-optic operations.
 - (3) Because viewing lightwave emissions directly with an optical instrument, such as an eye loupe, greatly increases the risk of eye damage, an appropriate label must appear in plain view on the front of the main frame or fiber-optic termination/interconnection equipment identifying this hazard.
- c) During service, maintenance, or restoration work, a lightwave transmission system can no longer be considered enclosed. Under such conditions, employees shall observe the following:
 - (1) Only authorized, trained employees are permitted to perform service, maintenance, and restoration work. Employees shall avoid exposing the eye to emissions from unterminated, energized fiber-optic connectors at close distances. The connectors associated with lightwave regenerators are normally recessed, thereby limiting the exposure distance. Under normal conditions, the regenerators can be removed or replaced without fear of eye injury. However, employees performing the removal or replacement

- work shall not stare or look directly into the vacant regenerator slot with optical instruments or magnifying lenses.
- (2) Only authorized, trained employees are permitted to use lightwave test equipment during installation/servicing work, since this equipment contains semiconductor lasers.
 - (3) Unauthorized employees shall be excluded from the immediate area of lightwave transmission systems during installation and service work. The area shall be properly barricaded and posted.
- d) If a fiber-optic cable breaks or is removed from its normal position, employees should observe the following precautions:
- (1) Do not examine or stare into broken, severed, or disconnected fiber-optic cables.
 - (2) Report any cable problems to your supervisor, who can arrange for authorized, trained installation/service personnel to repair or replace the cables.
- e) Employees who install, operate, maintain, or repair fiber-optic systems have, in addition to normal safety precautions, the following responsibilities:
- (1) Observe all GVP rules, procedures, and practices established for the safe operation of these systems.
 - (2) Notify a supervisor immediately of conditions or practices that may cause potential personal injury or property damage.
 - (3) Report to a supervisor immediately any known or suspected accidental exposure to laser radiation.
 - (4) Use appropriate safety glasses and gloves when working with fiber-optic systems.
 - (5) When using an ultraviolet lamp for curing adhesive during splicing of fiber-optic material, only approved eyewear shall be worn.
 - (6) Employees shall always treat every fiber as active and when using laser, take the appropriate safety precautions.
 - (7) Eating or drinking in the fiber work area is prohibited.
 - (8) Employees shall be informed not to rub eyes or use the restroom without washing their hands first.
 - (9) Do not assume that fiber-optic cable does not pose an electrical hazard. The fibers themselves are dielectric, but if the cable contains any metallic parts at all, the cable is conductive and should be treated accordingly.
 - (10) Always apply temporary grounding and bonding harnesses to the cable while working with it.
 - (11) Solvents and chemicals used for stripping fibers and cleaning shall be used in adequately ventilated areas.
- f) Cleaved glass fibers are very sharp and can pierce the skin easily. Do not let cut pieces of fiber stick to your clothing or drop in the work area. Use tweezers to pick up cut pieces of the glass fibers and place them on a loop of tape kept for that purpose.
- g) Employees shall wear safety glasses and gloves when handling fibers.
- h) When using tools such as hook blades to strip cable, employees shall guard against the blade slipping and cutting their hands and arms.
- i) When using diagonal cutters to cut or trim the metallic strength members of the cable, do not cut more than one strand member at a time and be sure to hold the portion to be cut as close to the floor as possible away from other people.

- j) When using razor blades for light trimming operations, always cut away from body, do not use a dull blade, do not attempt heavy cutting with a razor blade, and dispose of razor blade properly.
- k) When using utility knives for heavier cutting operations, always cut away from the body, never use a dull blade, and hold the knife in one hand and the cable with the other.
- l) Fiber cable sheath ease of removal is contingent on temperature. Use extra caution in colder temperatures.

511.2 Radio Frequency Radiation

- a) Utilization of Radio Frequency (RF) Source Equipment Which Meets Applicable Safety Standards:
 - (1) RF source equipment shall meet all Federal Communications Commission (FCC) RF regulations and other applicable safety standards.
 - (2) FCC certification will be required on all future purchase orders for RF amplified equipment.
 - (3) Any service, modification, or action that has been performed on equipment that is responsible for amplifying or coupling amplified signals will be checked with RF survey equipment immediately after service and before returning that system to operational status.
- b) RF Hazard Identification and Periodic Surveillance:
 - (1) Screening measurements shall be completed to identify potentially hazardous RF areas. More complex measurements may be necessary when employee exposures approach FCC established maximum permissible exposure (MPE) limits. (Refer to Table 511-1.)
 - (2) Conducting objects in close vicinity shall be evaluated to ensure that they do not constitute RF shock and burn hazards.
 - (3) Surveys of RF levels shall be conducted during the development of work practices to ensure they are effective in preventing excessive exposures to RF radiation.
 - (4) Appropriate work practices must be followed during the repair and maintenance of RF equipment.
 - (5) Surveys of RF levels shall be conducted to ensure that personal protective equipment is applicable and effective for the specific worksite conditions.
- c) Identification and Implementation of Controls in RF Hazard Areas:
 - (1) Access to any areas where RF fields could exceed the FCC established MPE limits for the general public shall be restricted.

Table 511-1. Limits for Maximum Permissible Exposure				
(A) Limits for Occupational/Controlled Exposure				
Frequency Range (MHZ)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time IEP ² , IHI ² , or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1,842/f	4.89/f	(900/f ²)*	6
30-300	61.4	0.163	1.0	6
300-1,500	--	--	f/300	6
1,500-100,000	--	--	5	6
(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHZ)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time IEP ² , IHI ² , or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ²)*	30
30-300	27.5	0.073	0.2	30
300-1,500	--	--	f/1,500	30
1,500-100,000	--	--	1.0	30
f= frequency in MHz		*Plane-wave equivalent power density		
Note 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment, provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply, provided he is made aware of the potential for exposure.				
Note 2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.				

- (2) Exposure time and distance between the RF source and employee shall be controlled in order to ensure that workers' exposures remain below recommended levels.
 - (3) RF hazard areas shall be identified to alert employees of areas that are not to be occupied during RF application.
 - (4) The antenna and transmitter shall be deactivated prior to being serviced.
 - (5) Access to RF hazard areas shall be controlled with standard lockout/tagout procedures to ensure employees are not occupying these areas during the application of RF energy.
 - (6) Transmitters shall not be operated without shields.
 - (7) Appropriately selected and properly used RF protective clothing shall be used to reduce whole body RF absorption below established MPE.
 - (8) Employees working near or in the vicinity of radiating antennas or transmitters may be required to wear and use appropriately selected personal RF monitoring devices to ensure exposure levels are below the established MPE.
 - (9) RF hazard areas shall be clearly marked with appropriate signs, barricades, floor markings, etc., such that any worker who has access to the facility will be alerted not to occupy the hazardous locations.
 - (10) Signs shall be of standard design and shape, and of sufficient size to be recognized and readable from a safe distance. Refer to Figure 511-1.
 - (11) Screening measurements shall be used to determine where signs are to be located in order to alert workers approaching a RF hazard area.
 - (12) The evacuation of hazard areas prior to RF application shall be strictly enforced.
- d) RF Safety and Health Training:
- (1) All employees who are required to work in a controlled environment, where power densities could exceed the FCC general public MPE limits, shall be aware of the potential exposure RF fields and should be informed of the steps they must take to ensure they are not exposed to RF fields in excess of the MPE limits.

Figure 511-1. Radio Frequency Radiation Warning Symbol



- (2) RF awareness training shall include applicable principles for working safely near energized communications antennas and equipment as well as guidance for personal protection that will be encountered under specific workplace conditions.
- (3) Employees shall adhere to the following principles when working around RF equipment:
 - (a) Employees shall assume all antennas are active and energized.
 - (b) Employees shall maintain an established safe distance from all antennas.
 - (c) Employees shall obey all posted signs and warnings.
 - (d) Employees shall not stop near omnidirectional antennas or in front of directional antennas, and should keep below elevated antennas.
- (4) All employees relying on and using personal monitoring equipment require training in the appropriate use and limitations of the device.
- e) Medical Surveillance Program:
 - (1) Employees shall report the occurrence of RF burns, or the sensation of nonroutine heating, to their supervisor.
 - (2) Employees shall notify their supervisor of any implanted medical devices prior to working around RF equipment.
- f) Periodic RF screening and measurements are necessary to ensure conditions have not changed and that the RF protection program continues to be effective in preventing excessive RF exposures.
- g) For more information on working with communication facilities, refer to OSHA Standards 29 CFR 1910.197, 29 CFR 1910.268, and 29 CFR 1910.269(s).

512 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.

512. 1 General Rules

- 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.
- a) No parking shall be allowed within the substation unless required for work purposes.
- b) Vehicles shall not be driven over wire troughs, unless designed for vehicular traffic.
- c) Before driving a vehicle into a substation, employees shall check clearances between protruding parts of the vehicle and the substation equipment.
- d) Precautions should be taken to protect against induced charge on all equipment and vehicles.
- e) Caution shall be exercised to maintain a minimum clear working space in the direction of access to live parts of electric equipment. Except as elsewhere required or permitted, the minimum clear working space in the direction of access to live parts of electric equipment may not be less than specified in Table 512-1. Distances shall be measured from the live parts, if they are exposed, or from the enclosure front or opening, if they are enclosed.
- f) No materials or equipment shall be stored under energized buses, lines or near energized equipment, excluding the mobile substation.
- g) 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. Dispatch shall be notified.
- h) Proper PPE shall be worn when working in a substation (refer to Part 4, Personal Protective Equipment).
- i) When substation fences are expanded or a section is removed, grounding continuity shall be maintained and bonding shall be used to prevent electrical discontinuity.
- j) When 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. Refer to OSHA 1910.303(h)(2)(ii) for more information.
- k) Movement of vehicles, gin poles, cranes, and other hoisting or mechanized equipment shall be controlled by signalmen or flagmen when required.
- l) 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. Refer to ANSI/IEEE Standard 142.

- m) Sufficient access and working space shall be provided and maintained around electric equipment to permit ready and safe operation and maintenance of such equipment.
- n) 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.
- o) When working in a substation, job briefings will be conducted in accordance with Section 115.5, Job Briefings.
- p) For more information, refer to OSHA 1910.269.

Table 512-1. Minimum Depth of Clear Working Space at Electric Equipment, Over 600 V						
Nominal voltage to ground	Minimum Clear Distance for Condition^{1,2}					
	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 ³	1.8	6.0	2.5	8.0	3.0	10.0
Above 75 kV ³	2.5	8.0	3.0	10.0	3.7	12.0
¹ 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. 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. ² Working 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 de-energized parts on the back of enclosed equipment, a minimum working space 762 mm (30 in.) horizontally shall be provided. ³ Minimum 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 16, 1981.						

512.2 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 extraordinary caution 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 on or from the structural steel, at elevations more than 6 feet (refer to OSHA 1926.501 for more information).
- 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:
- Installation, removal, or repair of lines or equipment (such as transformers, capacitors, and regulators) that are energized at more than 600 volts.
 - 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.
 - Work using mechanical equipment, other than insulated aerial lifts, near parts energized at more than 600 volts.
 - 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:
- Routine circuit switching, if the employer can demonstrate that conditions at the site allow this work to be performed safely.
 - Work performed with live-line tools if the employee is neither within reach of nor otherwise exposed to contact with energized parts.
 - 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. In the event material is needed to be thrown to the ground, work area below will be cleared of all personnel.**
- h) All energized conductors and equipment within reaching distance shall be protected by appropriate cover up. Refer to Table 507-4, Communication Work Minimum Approach Distances, of this *Safety Manual*.
- 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 20,000 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 drawout 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) Refer to Section 407, Care and Use of Rubber Gloves.
- z) Employees shall wear appropriate PPE for the work being performed. Refer to Part 4, Personal Protective Equipment.

512.3 Hazardous Energy Control (Lockout/Tagout) Procedures

Refer to Section, 202 Hazardous Energy Control (Lockout/Tagout) Procedures.

Note: Also refer to GVP-specific hazardous energy control and switching procedures.

512.4 Batteries

- a) For additional information refer to manufacturer's product information and MSDS.

- 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.”
- a) Refer to ANSI/IEEE Standard Z358.1-2009 for most current eye wash requirements.
- b) Employees shall wear appropriate clothing and PPE when handling or repairing batteries, such as appropriate gloves, apron, eyewear, face shield, etc.
- c) 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.
- d) When working on or near a battery, nonconductive tools are recommended. Tools used for tightening connector bolts, etc., should have insulated handles.
- e) 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.
- f) Precaution shall be used when handling electrolyte and other chemicals.
- g) If electrolyte is spilled on clothing, the contaminated clothing shall be removed and the skin washed with water as soon as possible.
- h) Open flames, tools that can cause sparks, and other sources of ignition shall be kept clear of the immediate area where batteries are located.
- i) When it is necessary to work in battery rooms where sources of ignition exist, the room shall be adequately ventilated. The battery charger shall be turned OFF when practical.
- j) 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.
- k) In the case of a NiCad cell care shall be exercised to prevent grounding as the case is part of an electrical circuit.
- l) When removing a battery, the ground connection shall be the first connection removed. When installing a battery, the ground connection should be the last connection made.
- m) When using a hydrometer to check batteries, care shall be taken to prevent splashing battery acid.
- n) Rooms and areas housing exposed electrical parts above 50 volts shall be locked and access limited to authorized personnel. Refer to OSHA 1910.303(g)(2)(i) for more information.
- o) Batteries shall be properly disposed of in an environmentally safe manner.
- p) De-energized batteries awaiting disposal shall be safely stored in a ventilated area away from ignition sources.

512.8 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 Section 202, Hazardous Energy Control (Lockout/Tagout) Procedures.
- 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 Section 202, Hazardous Energy Control (Lockout/Tagout) Procedures.
- d) A check shall be made to determine that all disconnects or air-break switches are in the OPEN position. The blades shall rest in the full 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) When testing a CB, the test equipment and the vehicle shall be grounded to the substation ground.
- g) The case of all test transformers shall be grounded when in use, providing such cases are made of metal.
- h) When a CB is being operated electrically or by spring, employees shall keep hands clear of the mechanical closing mechanism.
- i) The secondary side of an energized current transformer shall not be opened.
- j) 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 control power shall be disconnected.
 - (1) All dc control power shall be disconnected.
 - (2) The main control valve shall be OFF.
 - (3) Operating mechanism shall be the relaxed position or blocked to prevent movement,

Note: Entry shall be in accordance with approved procedures for enclosed or confined spaces. Refer to Section 201, Confined or Enclosed Spaces.

- a) When employees are working inside the tank, the breaker shall not be closed electrically or by spring.
- b) 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. Refer to Sections 506.8-10, Ladders, for additional requirements.
- c) When working on top of a CB proper PPE shall be used (refer to Part 4, Personal Protective Equipment, for additional requirements). Also refer to Section 203, Fall Protection, and OSHA 1926.501 for additional requirements.
- d) After all work has been completed, a careful check shall be made to see that all tools and materials have been removed.

512.9 Working in Transformer Tanks and Vessels

- a) Entry into tanks and vessels shall be in compliance with the Permit-Required Confined Spaces Program. Refer to Section 201, Confined or Enclosed Spaces.
- 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.

512.10 Work in Manholes and Vaults

Note: Refer to Section 201, Confined or Enclosed Spaces, and Section 509.2, Entering Underground Structures.

- 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. Refer to OSHA 1910.146 for additional information on testing and ventilation.
- 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 of 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 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.
- s) ***Communications.***

- The employer shall ensure that employees maintain reliable communications, through two-way radios or other equivalent means, among all employees involved in the job.
- t) Refer to OSHA 1910.269 for additional information on manhole and vault requirements.

512.11 Splicing and Terminating

Refer to Section 201, Confined or Enclosed Spaces, Section 512.10, Work in Manholes and Vaults, and Section 509.2, Entering Underground Structures.

- a) Furnaces and solder pots shall be placed at a safe distance from the hole and shall be placed on the side away from approaching traffic.
- b) When work is to be done in a manhole or a vault, proper work area protection shall be installed.
- c) Material, hot solder, or hot compound shall not be lowered into the hole until definite instructions to do so have been given by an employee in the hole.
- (1) Gloves, sleeves, and safety glasses shall be worn while heating or working with hot insulating compounds or metals.
- (2) Furnaces and tanks containing butane or propane shall not be placed in a manhole or vault.
- (3) Heating pots for solder, oil, or compound shall be safely positioned so that the contents cannot enter the vault or manhole in the event of spillage.
- d) Identifying tags or markers shall not be removed from more than one cable at the same time.
- e) 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 the proper authority identifies it.
- f) 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 cable 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.
- g) After employees receive clearance and before spiking a cable, all phases of the cable shall be grounded at both ends wherever practicable.
- h) After the cable has been identified and the above precautions have been taken, the cable shall be spiked. No employee shall remain in the manhole or vault at the time the spiking test is made.
- i) When cutting an energized multiple conductor cable, a piece of fiber or wood shall be placed between the conductor being cut and the other conductors, and the cut shall be made directly over the shield.
- j) Immediately after each conductor of an energized multiple conductor cable is cut in two, the ends shall be insulated before another conductor is cut. During the course of the work, only one uninsulated conductor shall be exposed at any one time.
- k) ***Sheath Continuity.***

When employees perform work on buried cable or on cable in a manhole or vault, the employer shall maintain metallic sheath continuity, or the cable sheath shall be treated as energized. Totally isolating the cable and setting up an Equi-potential Zone to protect the employee.

512.12 Vault/Manhole Rescue

For additional information concerning confined space requirements, refer to Section 201, Confined or Enclosed Spaces, and OSHA Standards 29 CFR 1910.269 and 29 CFR 1910.146.

512.13 OSHA References

- a) For additional information concerning substations, refer to OSHA Standard 29 CFR 1910.269.
- b) For more specific information on guarding of rooms containing electrical supply equipment and guarding of energized parts, refer to OSHA Standard 29 CFR 1910.269 (u) (4) and (5). 1910.30.

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Appendix D – CPR/First Aid/AED Resources

There are numerous excellent resources for information on cardiopulmonary resuscitation (CPR), first aid, and automated external defibrillator (AED) training. In this *Manual*, Section 114 provides a basic overview of the general guidelines for these practices. Listed below are several industry-accepted and commonly used training resources and reference guidelines for CPR, first aid, and AEDs.

American Heart Association (www.heart.org)

The American Heart Association provides general health information (with a special focus on heart-health), manages training courses and materials, and conducts ongoing research. Information is available for safety trainers as well as employees.

American Red Cross (www.redcross.org)

The American Red Cross offers services in many areas, including: community services that help the needy; support and comfort for military members and their families; the collection, processing and distribution of lifesaving blood and blood products; educational programs that promote health and safety; and international relief and development programs.

American Safety and Health Institute (www.ashinstitute.org)

The American Safety and Health Institute (ASHI) provides basic and advanced emergency care and resuscitation training programs.

MEDIC First Aid (<http://hsi.com/medicfirstaid>)

MEDIC First Aid hosts CPR/AED and first aid emergency care training programs for business, industry, and the public. MEDIC First Aid training programs are geared towards teaching and certifying emergency care and first aid providers in business, general industry, and the public.

National Safety Council (Green Cross) (www.nsc.org)

The National Safety Council is a nonprofit organization whose mission is to save lives by preventing injuries and deaths at work, in homes and communities and on the road through leadership, research, education and advocacy. The NMSC aims to prevent unintentional injuries and deaths by providing knowledge and resources that enable them to reduce risks, engage employees, measure progress and continuously improve their safety management systems.