EXHIBIT 14.1 NECA'S LIST OF 2001 SAFETY PUBLICATIONS

The NECA's safety and Insurance publications listed below may be purchased by calling the order desk at 301-215-4504 or by ordering on NECA web site http://www.necanet.org/safety/publications.htm.

Year	Title	Number	Member Cost	Non-Member Cost
2002	Electrical Safety Work Practices Manual	5066	$ 49	$ 79
2002	Confined Space Entry Manual	5090	$ 49	$ 79
2002	NECA Safety Expert System Version 2.1 Software	5119S	$ 300	$ 450
2001	OSHA Construction Safety & Health Standards	5100	$ 18	$ 40
2000	V/D/V Contractor Safety Compliance Manual	5124	$ 49	$ 75
2000	Basic Safety Manual for Electrical Contractors	8100	$ 75	$ 113
2000	Lockout/Tagout Compliance Manual	5057	$ 40	$ 60
2000	Electrical Construction Employee Safety Handbook	5028	$ 1<	$ 3
1999	Respiratory Protection Program Guidelines	5123	$ 30	$ 45
1998	Risk Management and Insurance Manual	8104	$ 67	$ 100
1998	Project Safety and Loss Control Manual	5121	$ 99	$ 150
1998	Supervisor's Guide to Safety Training	5122	$ 21	$ 32
1998	Personnel Protective Equipment Guide	5120	$ 30	$ 45
1997	OSHA Safety & Health Standards Digest for Construction	5044	$ 3<	$ 5
1997	Scaffold Safety Survival Kit	5115K	$ 60	$ 90
1996	Mobile Scaffold Sample Written Program	5114	$ 7	$ 11
1996	NECA Guide to 29 CFR 1910.269	5110	$ 7	$ 11
1996	Emergency Response Sample Written Program	5111	$ 7	$ 11
1996	Motor Fleet Sample Written Program	5113	$ 7	$ 11
1995	Controlling Electrical Hazards Sample Written Program	5106	$ 7	$ 11
1995	Fall Protection Sample Written Program	5097R	$ 7	$ 11
1995	Air and Power Tools Sample Written Program	5101	$ 7	$ 11
1995	Welding and Cutting Safety Sample Written Program	5102	$ 7	$ 11
1994	Ladder Safety Sample Written Program	5062	$ 7	$ 11
1994	Fire Safety Sample Written Program	5096	$ 7	$ 11
1994	Hand and Power Tools Sample Written Program	5094	$ 7	$ 11
1994	Lead Standards Sample Written Program	5092	$ 7	$ 11
1994	Bloodborne Pathogens Sample Written Program	5095	$ 7	$ 11
1993	OSHA Inspection Survival Guide Booklet	5087	$ 7	$ 11
1990	Excavation Standard Sample Written Program	5062	$ 7	$ 11
1990	Electrical Construction HazCom Manual	5052	$ 75	$ 113
1990	Hazard Communication - Guide for Electrical Contractors	5047	$ 7	$ 11
1990	HazCom Sample Written Program	5056	$ 7	$ 11

EXHIBIT 14.2 NECA - NATIONAL ELECTRICAL INSTALLATION STANDARDS

The following NECA - National Electrical Installation Standards (NEIS) can be ordered on www.neca-neis.org, or by calling NECA Order Desk at 301-215-4504, and/or use the online shopping cart where you can purchase the publication in real time as a downloadable PDF.

NECA/BICSI 568-2001 - STANDARD FOR INSTALLING COMMERCIAL BUILDING TELECOMMUNICATIONS SYSTEMS (ANSI). Describes procedures for installing voice-data-video networks. It is based on the performance requirements of TIA/EIA 568-B-2001, recognized as the governing standard for VDV networking.

NECA 409-2001 - RECOMMENDED PRACTICE FOR INSTALLING GENERAL PURPOSE, DRY-TYPE TRANSFORMERS LESS THAN 800 VOLTS. Describes industry "best practices" for installing transformers typically used in power distribution systems for buildings and similar structures. It covers routine testing and maintenance procedures for transformers, as well as special procedures to be used after adverse circumstances.

NECA 408-2001- RECOMMENDED PRACTICE FOR INSTALLING AND MAINTAINING BUSWAYS - Describes "best practices" for installing busways typically used for distributing power in industrial-type buildings and facilities. It will also cover routine testing and maintenance procedures for busways, as well as special procedures to be used after adverse circumstances such as a ground fault or immersion in water.

NECA 405-2001 - RECOMMENDED PRACTICE FOR INSTALLING & COMMISSIONING INTERCONNECTED GENERATION SYSTEMS (ANSI). Describes procedures for installing, commissioning, relaying, and metering of electric power production sources operating in parallel with an electric utility source. NECA developed this publication in conjunction with T.A. Engineering, Inc. of Baltimore, Maryland. T.A. Engineering has extensive experience designing distributed power systems and combined heat/power generation systems. The company's projects include both conventional co-generation projects up to 10 megawatts and a 200 kilowatt fuel cell installation. NECA 405 is approved as an American National Standard (ANSI).

NECA 202-2001 - RECOMMENDED PRACTICE FOR INSTALLING AND MAINTAINING INDUSTRIAL HEAT TRACING SYSTEMS. Describes procedures for installing, testing, and documenting electrical freeze protection and process heat tracing systems. NECA wrote this publication in conjunction with Tyco Thermal Controls, a major manufacturer of industrial heat tracing systems. NECA 202 is approved as an American National Standard (ANSI).

NECA 101-2001- STANDARD FOR INSTALLING STEEL CONDUIT - Describes installation practices for rigid metal conduit (RMS), intermediate metal conduit (IMC), electrical metallic tubing (EMT), and steel conduit with supplementary PVC coating. Includes guidelines for conduit bending and threading. Developed jointly with the Steel Tube Institute of North America (STI).

NECA/IESNA 501-2000 - RECOMMENDED PRACTICE FOR INSTALLING EXTERIOR LIGHTING SYSTEMS (ANSI) - This publication describes installation procedures for lighting systems commonly used outdoors, including pole-mounted floodlights and spotlights, wall-bracket fixtures, illuminated bollards, and landscape lighting. NECA/IESNA 501 was jointly developed with the Illuminating Engineering Society of North America and is approved as an American National Standard (ANSI).

NECA/EGSA 404-2000 - RECOMMENDED PRACTICE FOR INSTALLING GENERATOR SETS (ANSI) - Describes installation procedures for generator sets used for on-site power production, including emergency applications. NECA/EGSA 404 was jointly developed with the Electrical Generating Systems Association and is approved as an American National Standard (ANSI).

NECA 402-2000 - RECOMMENDED PRACTICE FOR INSTALLING AND MAINTAINING MOTOR CONTROL CENTERS - Describes installation and maintenance practices for motor control centers rated 600 volts or less. It also covers periodic routine maintenance procedures for motor control centers, and special procedures to be used after adverse circumstances such as a short-circuit, ground fault, or immersion in water. NECA 402 is approved as an American National Standard (ANSI).

NECA/AA 104-2000 - RECOMMENDED PRACTICE FOR INSTALLING ALUMINUM BUILDING WIRE AND CABLE (ANSI). Describes installation procedures and design considerations for aluminum building wire and cable in residential, commercial, institutional, and industrial applications not exceeding 600 volts. This publication covers aluminum alloy building wire and cable types RHH, RHW, RHW-2, THW, THW-2, THHN, THWN, THWN-2, XHHW, and XHHW-2; and AC, MC, TC, and SE. NECA/AA 104, developed jointly with The Aluminum Association, is approved as an American National Standard (ANSI).

NECA 1-2000 STANDARD PRACTICES FOR GOOD WORKMANSHIP IN ELECTRICAL CONTRACTING - NECA 1 defines "neat and workmanlike" procedures for installing a variety of electrical equipment. Positioned as the centerpiece publication of the series, it covers a variety of topics that include handling construction materials on site, installing, mounting and supporting electrical equipment, and the Americans with Disability Act Guidelines for locating electrical products and systems. NECA 1-2000 updates the 1988 version of NECA's Standard of Installation and is approved as an American National Standard.

NECA/IESNA 502-1999 RECOMMENDED PRACTICE FOR INSTALLING INDUSTRIAL LIGHTING SYSTEMS (ANSI) - Describes installation procedures for lighting systems commonly used in industrial buildings, including HID and fluorescent pendant luminaries. ANSI approved.

NECA 100-1999 SYMBOLS FOR ELECTRICAL CONSTRUCTION DRAWINGS (ANSI) - This standard reflects current North American practice for electrical construction drawing symbols. This standard does not include symbols based on standards of the International Electrotechnical Commission (IEC). However, IEC-style symbols for fire alarm systems, included in NFPA standard 170, are shown in an appendix. NECA 100 is approved as an American National Standard (ANSI).

NECA/IESNA 500-1998 - RECOMMENDED PRACTICE FOR INSTALLING INDOOR COMMERCIAL LIGHTING SYSTEMS (ANSI) - This nationally accepted ANSI standard describes installation procedures for lighting systems commonly used in commercial and retail buildings. Jointly developed with the Illuminating Engineering Society of North America. NECA 500 is approved as an American National Standard (ANSI).

NECA 400-1998 - RECOMMENDED PRACTICE FOR INSTALLING AND MAINTAINING SWITCHBOARDS (ANSI) - Describes installation and maintenance practices for deadfront distribution switchboards rated 600 volts or less. Also covers periodic routine maintenance procedures for switchboards and special procedures to be used after adverse circumstances such as a short-circuit, ground-fault, or immersion in water. NECA 400 is approved as an American National Standard (ANSI).

NECA/FOA 301-1998 - STANDARD FOR INSTALLING AND TESTING FIBER OPTIC CABLES - Describes installation practices for optical fiber systems used for communications purposes. Jointly developed with Fiber Optic Association, the certification body for fiber optic technicians and installers.

NECA 5060-2001 - STATE ELECTRICAL REGULATIONS - An invaluable reference for contractors, manufacturers, and others who operate in multiple jurisdictions around the country. This publication summarizes information about electrical codes, code enforcement, and contractor/electrician licensing in every state plus the District of Columbia. Contains contact names and phone numbers for state agencies that regulate electrical construction. This publication is only available as a free PFD download on NECA-NEIS's web site.

EXHIBIT 14.3 GLOSSARY OF OSHA STANDARDS ELECTRICAL TERMS

Acceptable. An installation or equipment is acceptable to the Assistant Secretary of Labor, and approved within the meaning of this OSHA electrical safety standards:

(i) If it is acceptable, or certified, or listed, or labeled, or otherwise determined to be safe by a nationally recognized testing laboratory; or

(ii) With respect to an installation or equipment of a kind, which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, if it is inspected or tested by another Federal agency, or by a State, municipal, or other local authority responsible for enforcing occupational safety provisions of the National Electrical Code, and found in compliance with the provisions of the National Electrical Code as applied in the OSHA electrical safety standards; or

(iii) With respect to custom-made equipment or related installations, which are designed, fabricated for, and intended for use by a particular customer, if it is determined to be safe for its intended use by its manufacturer on the basis of test data, which the employer keeps and makes available for inspection to the Assistant Secretary and his authorized representatives. Refer to 1910.7 for definition of nationally recognized testing laboratory.

Accepted. An installation is accepted if it has been inspected and found by a nationally recognized testing laboratory to conform to specified plans or to procedures of applicable codes.

Accessible. (As applied to wiring methods) Capable of being removed or exposed without damaging the building structure or finish, or not permanently closed in by the structure or finish of the building - see *concealed* and *exposed.*

Accessible. (As applied to equipment) Admitting close approach; not guarded by locked doors, elevation, or other effective means - see readily accessible

Ampacity. Current-carrying capacity of electric conductors expressed in amperes.

Appliances. Utilization equipment, generally other than industrial, normally built in standardized sizes or types, which is installed or connected as a unit to perform one or more functions, such as, clothes washing, air conditioning, food mixing, deep frying, etc.

Approved. Acceptable to the Assistant Secretary of Labor for Occupational Safety and Health.

Approved for the purpose. Approved for a specific purpose, environment, or application described in a particular standard requirement. (Suitability of equipment or materials for a specific purpose, environment or application may be determined by a nationally recognized testing laboratory, inspection agency or other organization concerned with product evaluation as part of its listing and labeling program - see Labeled or Listed.)

Armored cable. Type AC armored cable is a fabricated assembly of insulated conductors in a flexible metallic enclosure.

Askarel. A generic term for a group of nonflammable synthetic chlorinated hydrocarbons used as electrical insulating media. Askarels of various compositional types are used. Under arcing conditions the gases produced, while consisting predominantly of noncombustible hydrogen chloride, can include varying amounts of combustible gases depending upon the askarel type.

Attachment plug (Plug cap) (Cap). A device which, by insertion in a receptacle, establishes connection between the conductors of the attached flexible cord and the conductors connected permanently to the receptacle.

Authority Having Jurisdiction. The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

Automatic. Self-acting, operating by its own mechanism, when actuated by some impersonal influence, as, for example, a change in current strength, pressure, temperature, or mechanical configuration.

Bare conductor - see *Conductor.*

Bonding. The permanent joining of metallic parts to form an electrically conductive path, which will assure electrical continuity and the capacity to conduct safely any current likely to be imposed.

Bonding jumper. A reliable conductor to assure the required electrical conductivity between metal parts required to be electrically connected.

Branch circuit, General Purpose. The branch circuit that supplies two or more receptacles or outlets for lighting and appliances.

Building. A structure, which stands alone or which is cut off from adjoining structures, by fire walls with all openings therein protected by approved fire doors.

Cabinet. An enclosure designed either for surface or flush mounting, and provided with a frame, mat, or trim in which a swinging door or doors are or may be hung.

Cable tray system. A unit or assembly of units or sections, and associated fittings, made of metal or other noncombustible materials forming a rigid structural system used to support cables. Cable tray systems include ladders, troughs, channels, solid bottom trays, and other similar structures.

Cablebus. An approved assembly of insulated conductors with fittings and conductor terminations in a completely enclosed, ventilated, protective metal housing.

Center-pivot irrigation machine. A center pivot irrigation machine is a multi-motored irrigation machine, which revolves around a central pivot and employs alignment switches or similar devices to control individual motors.

Certified. Equipment is certified if it (a) has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner, or (b) is of a kind whose production is periodically inspected by a nationally recognized testing laboratory, and (c) it bears a label, tag, or other record of certification.

Circuit breaker.

(i) (600 volts nominal, or less). A device designed to open and close a circuit by nonautomatic means and to open the circuit automatically on a predetermined overcurrent without injury to itself, when properly applied within its rating.

(ii) (Over 600 volts, nominal). A switching device capable of making, carrying, and breaking currents under normal circuit conditions, and also making, carrying for a specified time, and breaking currents under specified abnormal circuit conditions, such as, those of short circuit.

Class I locations. Class I locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures. Class I locations include the following:

(I) *Class I, Division 1.* A Class I, Division 1 location is a location: (a) in which hazardous concentrations of flammable gases or vapors may exist under normal operating conditions; or (b) in which hazardous concentrations of such gases or vapors may exist frequently, because of repair or maintenance operations or because of leakage; or (c) in which breakdown or faulty operation of equipment or processes might release hazardous concentrations of flammable gases or vapors, and might also cause simultaneous failure of electric equipment.

Note: This classification usually includes locations, where volatile flammable liquids or liquefied flammable gases are transferred from one container to another; interiors of spray booths and areas in the vicinity of spraying and painting operations, where volatile flammable solvents are used; locations containing open tanks or vats of volatile flammable liquids; drying rooms or compartments for the evaporation of flammable solvents; locations containing fat and oil extraction equipment using volatile flammable solvents; portions of cleaning and dyeing plants, where flammable liquids are used; gas generator rooms and other portions of gas manufacturing plants, where flammable gas may escape; inadequately ventilated pump rooms for flammable gas or for volatile flammable liquids; the interiors of refrigerators and freezers in which volatile flammable materials are stored in open, lightly stoppered, or easily ruptured containers; and all other locations, where ignitable concentrations of flammable vapors or gases are likely to occur in the course of normal operations.

(ii) *Class I, Division 2.* A Class I, Division 2 location is a location: (a) in which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the hazardous liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment; or (b) in which hazardous concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operations of the ventilating equipment; or (c) that is adjacent to a Class I, Division 1 location, and to which hazardous concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

Note: This classification usually includes locations, where volatile flammable liquids or flammable gases or vapors are used, but which would become hazardous only in case of an accident or of some unusual operating condition. The quantity of flammable material that might escape in case of accident, the adequacy of ventilating equipment, the total area involved, and the record of the industry or business with respect to explosions or fires are all factors that merit consideration in determining the classification and extent of each location.

Piping without valves, checks, meters, and similar devices would not ordinarily introduce a hazardous condition even though used for flammable liquids or gases. Locations used for the storage of flammable liquids or a liquefied or compressed gases in sealed containers would not normally be considered hazardous, unless also subject to other hazardous conditions.

Electrical conduits and their associated enclosures separated from process fluids by a single seal or barrier are classed as a Division 2 location if the outside of the conduit and enclosures is a nonhazardous location.

Class II locations. Class II locations are those that are hazardous because of the presence of combustible dust. Class II locations include the following:

(i) *Class II, Division 1.* A Class II, Division 1 location is a location: (a) in which combustible dust is or may be in suspension in the air under normal operating conditions, in quantities sufficient to produce explosive or ignitable mixtures; or (b) where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitable mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electric equipment, operation of

Note: This classification may include areas of grain handling and processing plants, starch plants, sugar-pulverizing plants, malting plants, hay-grinding plants, coal pulverizing plants, areas where metal dusts and powders are produced or processed, and other similar locations, which contain dust producing machinery and equipment (except where the equipment is dust-tight or vented to the outside). These areas would have combustible dust in the air, under normal operating conditions, in quantities sufficient to produce explosive or ignitable mixtures. Combustible dusts, which are electrically nonconductive, include dusts produced in the handling and processing of grain and grain products, pulverized sugar and cocoa, dried egg and milk powders, pulverized spices, starch and pastes, potato and wood flour, oil meal from beans and seed, dried hay, and other organic materials, which may produce combustible dusts, when processed or handled. Dusts containing magnesium or aluminum are particularly hazardous and the use of extreme caution is necessary to avoid ignition and explosion.

(ii) *Class II, Division 2.* A Class II, Division 2 location is a location in which: (a) combustible dust will not normally be in suspension in the air in quantities sufficient to produce explosive or ignitable mixtures, and dust accumulations are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus; or (b) dust may be in suspension in the air as a result of infrequent malfunctioning of handling or processing equipment, and dust accumulations resulting therefrom may be ignitable by abnormal operation or failure of electrical equipment or other apparatus.

Note: This classification includes locations, where dangerous concentrations of suspended dust would not be likely, but where dust accumulations might form on or in the vicinity of electric equipment. These areas may contain equipment from which appreciable quantities of dust would escape under abnormal operating conditions or be adjacent to a Class II Division 1 location, as described above, into which an explosive or ignitable concentration of dust may be put into suspension under abnormal operating conditions.

Class III locations. Class III locations are those that are hazardous, because of the presence of easily ignitable fibers or flyings, but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitable mixtures. Class III locations include the following:

(i) *Class III, Division 1.* A Class III, Division 1 location is a location in which easily ignitable fibers or materials producing combustible flyings are handled, manufactured, or used.

Note: Such locations usually include some parts of rayon, cotton, and other textile mills; combustible fiber manufacturing and processing plants; cotton gins and cotton-seed mills; flax-processing plants; clothing manufacturing plants; woodworking plants, and establishments; and industries involving similar hazardous processes or conditions.

Easily ignitable fibers and flyings include rayon, cotton (including cotton linters and cotton waste), sisal or henequen, istle, jute, hemp, tow, cocoa fiber, oakum, baled waste kapok, Spanish moss, excelsior, and other materials of similar nature.

(ii) *Class III, Division 2.* A Class III, Division 2 location is a location in which easily ignitable fibers are stored or handled, except in process of manufacture.

Collector ring. A collector ring is an assembly of slip rings for transferring electrical energy from a stationary to a rotating member.

Combustible Gas Detection System. A protection technique utilizing stationary gas detectors in industrial establishments.

Concealed. Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though these may become accessible by withdrawing them - see Accessible, as applied to wiring methods.

Conductor.

(i) Bare. A conductor having no covering or electrical insulation whatsoever.

(ii) *Covered.* A conductor encased within material of composition or thickness that is not recognized as electrical insulation.

(iii) *Insulated.* A conductor encased within material of composition and thickness that is recognized as electrical insulation.

Conduit body. A separate portion of a conduit or tubing system that provides access through a removable cover(s) to the interior of the system at a junction of two or more sections of the system or at a terminal point of the system. Boxes such as FS and FD or larger cast or sheet metal boxes are not classified as conduit bodies.

Controller. A device or group of devices that serves to govern, in some predetermined manner, the electric power delivered to the apparatus to which it is connected.

Cooking unit, counter-mounted. A cooking appliance designed for mounting in or on a counter and consisting of one or more heating elements, internal wiring, and built-in or separately mountable controls.

Covered conductor - see Conductor.

Cutout. (Over 600 volts, nominal.) An assembly of a fuse support with either a fuseholder, fuse carrier, or disconnecting blade. The fuseholder or fuse carrier may include a conducting element (fuse link), or may act as the disconnecting blade by the inclusion of a nonfusible member.

Cutout box. An enclosure designed for surface mounting and having swinging doors or covers secured directly to and telescoping with the walls of the box proper - see *Cabinet.*

Damp location - see *Location.*

Dead front. Without live parts exposed to a person on the operating side of the equipment.

Device. A unit of an electrical system, which is intended to carry, but not utilize electric energy.

Dielectric heating. The heating of a nominally insulating material due to its own dielectric losses, when the material is placed in a varying electric field.

Disconnecting means. A device, or group of devices, or other means by which the conductors of a circuit can be disconnected from their source of supply.

Disconnecting (or Isolating) switch. (Over 600 volts, nominal.) A mechanical switching device used for isolating a circuit or equipment from a source of power.

Dry location - see *Location.*

Electric sign. A fixed, stationary, or portable self-contained, electrically illuminated utilization equipment with words or symbols designed to convey information or attract attention.

Electrical and Electronic Equipment. Materials, fittings, devices, appliances, and the like that are part of, or in connection with an electrical installation.

Enclosed. Surrounded by a case, housing, fence or walls, which will prevent persons from accidentally contacting energized parts.

Enclosure. The case or housing of apparatus, or the fence or walls surrounding an installation to prevent personnel from accidentally contacting energized parts, or to protect the equipment from physical damage.

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

Equipment grounding conductor - see *grounding conductor, equipment.*

Explosion-proof apparatus. Apparatus enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor, which may occur within it and of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and which operates at such an external temperature that it will not ignite a surrounding flammable atmosphere.

Exposed. (As applied to live parts.) Capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to parts not suitably guarded, isolated, or insulated - see Accessible and Concealed.

Exposed. (As applied to wiring methods.) On or attached to the surface or behind panels designed to allow access - see Accessible, as applied to wiring methods.

Exposed. (For the purposes of 1910.308(e), Communications systems.) Where the circuit is in such a position that in case of failure of supports or insulation, contact with another circuit may result.

Externally operable. Capable of being operated without exposing the operator to contact with live parts.

Feeder. All circuit conductors between the service equipment, or the generator switchboard of an isolated plant, and the final branch-circuit overcurrent device.

Fitting. An accessory, such as, a locknut, bushing, or other part of a wiring system that is intended primarily to perform a mechanical rather than an electrical function.

Fuse. (Over 600 volts, nominal.) An overcurrent protective device with a circuit opening fusible part that is heated and severed by the passage of overcurrent through it. A fuse comprises all the parts that form a unit capable of performing the prescribed functions. It may or may not be the complete device necessary to connect it into an electrical circuit.

Ground. A conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth, or to some conducting body that serves in place of the earth.

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

Grounded, effectively. (Over 600 volts, nominal.) Permanently connected to earth through a ground connection of sufficiently low impedance and having sufficient ampacity that ground fault current, which may occur cannot build up to voltages dangerous to personnel.

Grounded conductor. A system or circuit conductor that is intentionally grounded.

Grounding conductor. A conductor used to connect equipment or the grounded circuit of a wiring system to a grounding electrode or electrodes.

Grounding conductor, equipment. The conductor used to connect the non-current-carrying metal parts of equipment, raceways, and other enclosures to the system grounded conductor and/or the grounding electrode conductor at the service equipment or at the source of a separately derived system.

Grounding electrode conductor. The conductor used to connect the grounding electrode(s) to the equipment grounding conductor, to the grounded conductor, or to both, at the service, at each building or structure

Ground-fault circuit-interrupter. A device intended to protect persons by functioning to de-energize a circuit withing a short period of time when a current to ground exceeds the value established for a Class A device.

Guarded. Covered, shielded, fenced, enclosed, or otherwise protected by means of suitable covers, casings, barriers, rails, screens, mats, or platforms to remove the likelihood of approach to a point of danger or contact by persons or objects.

Health care facilities. Buildings or portions of buildings and mobile homes that contain, but are not limited to, hospitals, nursing homes, extended care facilities, clinics, and medical and dental offices, whether fixed or mobile.

Heating equipment. For the purposes of 1910.306(g), the term heating equipment includes any equipment used for heating purposes if heat is generated by induction or dielectric methods.

Hoistway. Any shaftway, hatchway, well hole, or other vertical opening or space in which an elevator or dumbwaiter is designed to operate.

Identified. Identified, as used in reference to a conductor or its terminal, means that such conductor or terminal can be readily recognized as grounded.

Insulated conductor - see *Conductor.*

Interrupter switch. (Over 600 volts, nominal.) A switch capable of making, carrying, and interrupting specified currents.

Irrigation machine. An irrigation machine is an electrically driven or controlled machine, with one or more motors, not hand portable, and used primarily to transport and distribute water for agricultural purposes.

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

Isolated power system. A system comprising an isolating transformer or it equivalent, a line isolation monitor, and its ungrounded circuit conductors.

Labeled. Equipment is labeled if there is attached to it a label, symbol, or other identifying mark of a nationally recognized testing laboratory, which (a) makes periodic inspections of the production of such equipment, and (b) whose labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner.

Lighting outlet. An outlet intended for the direct connection of a lampholder, a lighting fixture, or a pendant cord terminating in a lampholder.

Line-clearance tree trimming. The pruning, trimming, repairing, maintaining, removing, or clearing of trees *or* cutting of brush that is within 10 feet (305 cm) of electric supply lines and equipment.

Listed. Equipment is listed if it is of a kind mentioned in a list which, (a) is published by a nationally recognized laboratory, which makes periodic inspection of the production of such equipment, and (b) states such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner.

Live Parts. Energized conductive components.

Location -

(i) *Damp location.* Partially protected locations under canopies, marquees, roofed open porches, and like locations, and interior locations subject to moderate degrees of moisture, such as, some

(ii) *Dry location.* A location not normally subject to dampness or wetness. A location classified as dry may be temporarily subject to dampness or wetness, as in the case of a building under construction.

(iii) *Wet location.* Installations underground or in concrete slabs or masonry in direct contact with the earth, and locations subject to saturation with water or other liquids, such as, vehicle-washing areas, and locations exposed to weather and unprotected.

Luminaire. A complete lighting unit consisting of a lamp or lamps together with parts designed to distribute the light, to position and protect the lamps and ballast (where applicable), and to connect the lamps to the power supply.

May. If a discretionary right, privilege, or power is abridged or if an obligation to abstain from acting is imposed, the word "may" is used with a restrictive "no," "not," or "only." (E.g., no employer may...; an employer may not...; only qualified persons may...)

Medium voltage cable. Type MV medium voltage cable is a single or multiconductor solid dielectric insulated cable rated 2000 volts or higher.

Metal-clad cable. Type MC cable is a factory assembly of one or more conductors, each individually insulated and enclosed in a metallic sheath of interlocking tape, or a smooth or corrugated tube.

Mineral-insulated metal-sheathed cable. Type MI mineral-insulated metal-sheathed cable is a factory assembly of one or more conductors insulated with a highly compressed refractory mineral insulation and enclosed in a liquid tight and gas tight continuous copper sheath.

Mobile X-ray. X-ray equipment mounted on a permanent base with wheels and/or casters for moving, while completely assembled.

Nonmetallic-sheathed cable. A factory assembly of two or more insulated conductors having an outer sheath of moisture resistant, flame-retardant, nonmetallic material. Nonmetallic sheathed cable is manufactured in the following types:

(i) *Type NM.* The overall covering has a flame-retardant and moisture-resistant finish.

(ii) *Type NMC.* The overall covering is flame-retardant, moisture-resistant, fungus-resistant, and corrosion-resistant.

Oil (filled) cutout. (Over 600 volts, nominal.) A cutout in which all or part of the fuse support and its fuse link or disconnecting blade are mounted in oil with complete immersion of the contacts and the fusible portion of the conducting element (fuse link), so that arc interruption by severing of the fuse link or by opening of the contacts will

Open wiring on insulators. Open wiring on insulators is an exposed wiring method using cleats, knobs, tubes, and flexible tubing for the protection and support of single insulated conductors run in or on buildings, and not concealed by the building structure.

Outlet. A point on the wiring system at which current is taken to supply utilization equipment.

Outline lighting. An arrangement of incandescent lamps or electric discharge tubing to outline or call attention to certain features, such as, the shape of a building or the decoration of a window.

Oven, wall-mounted. An oven for cooking purposes designed for mounting in or on a wall or other surface and consisting of one of more heating elements, internal wiring, and built-in or separately mountable controls.

Overcurrent. Any current in excess of the rated current of equipment or the ampacity of a conductor. It may result from overload (see definition), short circuit, or ground fault. A current in excess of rating may be accommodated by certain equipment and conductors for a given set of conditions. Hence, the rules for overcurrent protection are specific for particular situations.

Overload. Operation of equipment in excess of normal, full load rating, or of a conductor in excess of rated ampacity, which, when it persists for a sufficient length of time, would cause damage or dangerous overheating. A fault, such as, a short circuit or ground fault, is not an overload - see Overcurrent.

Panelboard. A single panel or group of panel units designed for assembly in the form of a single panel; including buses, automatic overcurrent devices, and with or without switches for the control of light, heat, or power circuits; designed to be placed in a cabinet or cutout box placed in or against a wall or partition and accessible only from the front - see Switchboard.

Permanently installed decorative fountains and reflection pools. Those that are constructed in the ground, on the ground or in a building in such a manner that the pool cannot be readily disassembled for storage and are served by electrical circuits of any nature. These units are primarily constructed for their aesthetic value and not intended for swimming or wading.

Permanently installed swimming pools, wading and therapeutic pools. Those that are constructed in the ground, on the ground, or in a building in such a manner that the pool cannot be readily disassembled for storage, whether or not served by electrical circuits of any nature.

Portable X-ray. X-ray equipment designed to be hand-carried.

Power and control tray cable. Type TC power and control tray cable is a factory assembly of two or more insulated conductors, with or without associated bare or covered grounding conductors under a nonmetallic sheath, approved for installation in cable trays, in raceways, or where supported by a messenger wire.

Power fuse. (Over 600 volts, nominal.) See Fuse.

Power-limited tray cable. Type PLTC nonmetallic-sheathed power limited tray cable is a factory assembly of two or more insulated conductors under a nonmetallic jacket.

Power outlet. An enclosed assembly, which may include receptacles, circuit breakers, fuseholders, fused switches, buses and watt-hour meter mounting means; intended to supply and control power to mobile homes, recreational vehicles or boats, or to serve as a means for distributing power required to operate mobile or temporarily installed equipment.

Premises wiring system. That interior and exterior wiring, including power, lighting, control, and signal circuit wiring together with all of its associated hardware, fittings, and wiring devices, both permanently and temporarily installed, which extends from the load end of the service drop, or load end of the service lateral conductors to the outlet(s). Such wiring does not include wiring internal to appliances, fixtures, motors, controllers, motor control centers, and similar equipment.

Qualified person. A person who has the skill and knowledge related to the construction and operation of the electrical equipment and its installation. This person must have received safety training on the hazards involved with electrical systems.

Note 1: Whether an employee is considered to be a qualified person will depend upon various circumstances in the workplace. It is possible and, in fact, likely for an individual to be considered qualified with regard to certain equipment in the workplace, but unqualified as to other equipment. (See 1910.332(b)(3) for training requirements that specifically apply to qualified persons.)

Note 2: An employee, who is undergoing on-the-job training, and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training, and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties.

Raceway. A channel designed expressly for holding wires, cables, or busbars, with additional functions as permitted in the OSHA electrical safety standards. Raceways may be of metal or insulating material, and the term includes rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, liquid-tight flexible metal conduit, flexible metallic tubing, flexible metal conduit, electrical metallic tubing, underfloor raceways, cellular concrete floor raceways, cellular metal floor raceways, surface raceways, wireways, and busways.

Readily accessible. Capable of being reached quickly for operation, renewal, or inspections, without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, chairs, etc. - see Accessible.

Receptacle. A receptacle is a contact device installed at the outlet for the connection of a single attachment plug. A single receptacle is a single contact device with no other contact device on the same yoke. A multiple receptacle is a single device containing two or more receptacles.

Receptacle outlet. An outlet, where one or more receptacles are installed.

Remote-control circuit. Any electric circuit that controls any other circuit through a relay or an equivalent device.

Sealable equipment. Equipment enclosed in a case or cabinet that is provided with a means of sealing or locking so that live parts cannot be made accessible without opening the enclosure. The equipment may or may not be operable without opening the enclosure.

Separately derived system. A premises wiring system, whose power is derived from generator, transformer, or converter winding and has no direct electrical connection, including a solidly connected grounded circuit conductor, to supply conductors originating in another system.

Service. The conductors and equipment for delivering energy from the electricity supply system to the wiring system of the premises served.

Service cable. Service conductors made up in the form of a cable.

Service conductors. The supply conductors that extend from the street main or from transformers to the service equipment of the premises supplied.

Service drop. The overhead service conductors from the last pole or other aerial support to and including the splices, if any, connecting to the service-entrance conductors at the building or other structure.

Service-entrance cable. Service-entrance cable is a single conductor or multiconductor assembly provided with or without an overall covering, primarily used for services and of the following types:

(i) Type SE, having a flame-retardant, moisture-resistant covering, but not required to have inherent protection against mechanical abuse.

(ii) Type USE, recognized for underground use, having a moisture-resistant covering, but not required to have a flame-retardant covering or inherent protection against mechanical abuse. Single-conductor cables having an insulation specifically approved for the purpose do not require an outer covering.

Service-entrance conductors, overhead system. The service conductors between the terminals of the service equipment and a point usually outside the building, clear of building walls, where joined by tap or splice to the service drop.

Service entrance conductors, underground system. The service conductors between the terminals of the service equipment and the point of connection to the service lateral. Where service equipment is located outside the building walls, there may be no service-entrance conductors, or these may be entirely outside the building.

Service equipment. The necessary equipment, usually consisting of a circuit breaker or switch and fuses, and their accessories, located near the point of entrance of supply conductors to a building or other structure, or an otherwise defined area, and intended to constitute the main control and means of cutoff of the supply.

Service raceway. The raceway that encloses the service-entrance conductors.

Shielded nonmetallic-sheathed cable. Type SNM, shielded nonmetallic-sheathed cable is a factory assembly of two or more insulated conductors in an extruded core of moisture-resistant, flame-resistant nonmetallic material, covered with an overlapping spiral metal tape and wire shield and jacketed with an extruded moisture, flame-, oil-, corrosion-, fungus-, and sunlight-resistant nonmetallic material.

Show window. Any window used or designed to be used for the display of goods or advertising material, whether it is fully or partly enclosed or entirely open at the rear' and whether or not it has a platform raised higher than the street floor level.

Sign - see Electric Sign.

Signaling circuit. Any electric circuit that energizes signaling equipment.

Special permission. The written consent of the authority having jurisdiction.

Storable swimming or wading pool. A pool with a maximum dimension of 15 feet and a maximum wall height of 3 feet and is so constructed that it may be readily disassembled for storage and reassembled to its original integrity.

Structure. That which is built or constructed.

Switchboard. A large single panel, frame, or assembly of panels, which have switches, buses, instruments, overcurrent and other protective devices mounted on the face or back or both. Switchboards are generally accessible from the rear as well as from the front and are not intended to be installed in cabinets - see Panelboard.

Switches.

(i) *General-use switch.* A switch intended for use in general distribution and branch circuits. It is rated in amperes, and it is capable of interrupting its rated current at its rated voltage.

(ii) *General-use snap switch.* A form of general-use switch so constructed that it can be installed in flush device boxes or on outlet box covers, or otherwise used in conjunction with wiring systems recognized by this subpart.

(iii) *Isolating switch.* A switch intended for isolating an electric circuit from the source of power. It has no interrupting rating, and it is intended to be operated only after the circuit has been opened by some other means.

(iv) *Motor-circuit switch.* A switch, rated in horsepower, capable of interrupting the maximum operating overload current of a motor of the same horsepower rating as the switch at the rated voltage.

Switching devices. (Over 600 volts, nominal.) Devices designed to close and/or open one or more electric circuits. Included in this category are circuit breakers, cutouts, disconnecting (or isolating) switches, disconnecting means, interrupter switches, and oil (filled) cutouts.

Transportable X-ray. X-ray equipment installed in a vehicle or that may readily be disassembled for transport in a vehicle.

Utilization equipment. Equipment, which utilizes electric energy for mechanical, chemical, heating, lighting, or similar useful purpose.

Utilization system. A system, which provides electric power and light for employee workplaces, and includes the premises wiring system and utilization equipment.

Units of Measurement. Indicates that units in accordance with the modernized metric system known as the International System of Units (SI) shall appear first in the Code, with the inch-pound units following in parentheses.

Ventilated. Provided with a means to permit circulation of air sufficient to remove an excess of heat, fumes, or vapors.

Volatile flammable liquid. A flammable liquid having a flash point below 38 degrees C (100 degrees F) or whose temperature is above its flash point.

Voltage (of a circuit). The greatest root-mean-square (effective) difference of potential between any two conductors of the circuit concerned.

Voltage, nominal. A nominal value assigned to a circuit or system for the purpose of conveniently designating its voltage class (as 120/240, 480Y/277, 600, etc.). The actual voltage at which a circuit operates can vary from the nominal within a range that permits satisfactory operation of equipment.

Voltage to ground. For grounded circuits, the voltage between the given conductor and that point or conductor of the circuit that is grounded; for ungrounded circuits, the greatest voltage between the given conductor and any other conductor of the circuit.

Watertight. So constructed that moisture will not enter the enclosure.

Weatherproof. So constructed or protected that exposure to the weather will not interfere with successful operation. Rainproof, rain-tight, or watertight equipment can fulfill the requirements for weatherproof, where varying weather conditions other than wetness, such as, snow, ice, dust, or temperature extremes, are not a factor.

Wet location - see Location.

Wireways. Wireways are sheet-metal troughs with hinged or removable covers for housing and protecting electric wires and cable and in which conductors are laid in place after the wireway has been installed as a complete system.

EXHIBIT 14.4 OSHA CITATIONS FOR ELECTRICAL CONTRACTORS

Listed below are the top 15 standards which were cited by Federal OSHA for SIC 1731 - Electrical Work during the period October, 99 through September, 00.

Standard	*# Cited*	*# Inspected*	*$ Penalty*	*Average Cost/ Citation ($)*	*Description*
1926-405	387	254	$ 118,590	$ 306	Elec. Wiring Methods, Components
1926-403	284	222	$ 120,205	$ 423	Electrical, General Requirements
1926-404	163	145	$ 62,668	$ 384	Electrical, Wiring Design & Protection
1926-501	128	116	$ 93,825	$ 733	Fall Protection, Scope/Application
1926-1052	75	56	$ 22,217	$ 296	Stairways
1926-1053	75	57	$ 34,827	$ 464	Ladders
1926-20	64	58	$ 37,728	$ 589	Construction, General Safety & Health
1926-416	60	47	$ 87,078	$ 1,451	Electrical, Safety-Related Work Practices
1926-453	59	56	$ 38,602	$ 654	Manually-Propelled Mobile Scaffold
1926-1200	37	21	$ 2,036	$ 55	Hazard Communication
1926-21	37	37	$ 25,003	$ 675	Construction, Safety Training & Education
1926-100	36	36	$ 16,810	$ 451	Head Protection
1910.269	35	8	$ 67,190	$ 8,399	Electric Power Generation/Transmission/ Distribution
1926-503	32	29	$ 8,323	$ 260	Fall Protection Training Requirements
1926-1101	28	9	$ 8,070	$ 288	Asbestos

EXHIBIT 14.5 OSHA'S MULTI-EMPLOYER CITATION POLICY

On December 10, 1999, OSHA issued a directive CPL 2-0.124 that revised the Agency's citation policy for multi-employer worksites. The Agency has determined that this policy needs clarification. This directive describes the revised policy.

A. Continuation of Basic Policy. This revision continues OSHA's existing policy for issuing citations on multi-employer work sites. However, it gives clearer and more detailed guidance than did the earlier description of the policy in the OSHA's Field Inspection Reference Manual, including new examples explaining when citations should and should not be issued to exposing, creating, correcting, and controlling employers. These examples, which address common situations and provide general policy guidance, are not intended to be exclusive. In all cases, the decision on whether to issue citations should be based on all of the relevant facts revealed by the inspection or investigation.

B. No Changes in Employer Duties. This revision neither imposes new duties on employers nor detracts from their existing duties under the OSH Act. Those duties continue to arise from the employers' statutory duty to comply with OSHA standards and their duty to exercise reasonable diligence to determine whether violations of those standards exist.

1. MULTI-EMPLOYER WORKSITE POLICY. The following is the multi-employer citation policy:

A. Multi-Employer Worksites.

On multi-employer worksites (in all industry sectors), more than one employer may be citable for a hazardous condition that violates an OSHA standard. A two-step process must be followed in determining whether more than one employer is to be cited.

1. Step One. The first step is to determine whether the employer is a creating, exposing, correcting, or controlling employer. The definitions in paragraphs (B) - (E) below explain and give examples of each. Remember that an employer may have multiple roles (see paragraph H). Once you determine the role of the employer, go to Step Two to determine if a citation is appropriate (Note: only exposing employers can be cited for General Duty Clause violations).

2. Step Two. If the employer falls into one of these categories, it has obligations with respect to OSHA requirements. Step Two is to determine if the employer's actions were sufficient to meet those obligations. The extent of the actions required of employers varies based on which category applies. Note that the extent of the measures that a controlling employer must take to satisfy its duty to exercise reasonable care to prevent and detect violations is less than what is required of an employer with respect to protecting its own employees.

B. The Creating Employer

1. Step 1: Definition: The employer that caused a hazardous condition that violates an OSHA standard.

2. Step 2: Actions Taken: Employers must not create violative conditions. An employer that does so is citable even if the only employees exposed are those of other employers at the site.

   a. Example 1: Employer Host operates a factory. It contracts with Company S to service machinery. Host fails to cover drums of a chemical despite S's repeated requests that it do so. This results in airborne levels of the chemical that exceed the Permissible Exposure Limit.

      Analysis: Step 1: Host is a creating employer because it caused employees of S to be exposed to the air contaminant above the PEL. Step 2: Host failed to implement measures to prevent the accumulation of the air contaminant. It could have met its OSHA obligation by implementing the simple engineering control of covering the drums. Having failed to implement a feasible engineering control to meet the PEL, Host is citable for the hazard.

b. Example 2: Employer M hoists materials onto Floor 8, damaging perimeter guardrails. Neither its own employees nor employees of other employers are exposed to the hazard. It takes effective steps to keep all employees, including those of other employers, away from the unprotected edge and informs the controlling employer of the problem. Employer M lacks authority to fix the guardrails itself.

Analysis: Step 1: Employer M is a creating employer because it caused a hazardous condition by damaging the guardrails. Step 2: While it lacked the authority to fix the guardrails, it took immediate and effective steps to keep all employees away from the hazard and notified the controlling employer of the hazard. Employer M is not citable since it took effective measures to prevent employee exposure to the fall hazard.

C. The Exposing Employer

1. Step 1: Definition: An employer whose own employees are exposed to the hazard. See Chapter III, section (C)(1)(b) for a discussion of what constitutes exposure.

2. Step 2: Actions taken: If the exposing employer created the violation, it is citable for the violation as a creating employer. If the violation was created by another employer, the exposing employer is citable if it (1) knew of the hazardous condition or failed to exercise reasonable diligence to discover the condition, and (2) failed to take steps consistent with its authority to protect is employees. If the exposing employer has authority to correct the hazard, it must do so. If the exposing employer lacks the authority to correct the hazard, it is citable if it fails to do each of the following: (1) ask the creating and/or controlling employer to correct the hazard; (2) inform its employees of the hazard; and (3) take reasonable alternative protective measures. In extreme circumstances (e.g., imminent danger situations), the exposing employer is citable for failing to remove its employees from the job to avoid the hazard.

a. Example 3: Employer Sub S is responsible for inspecting and cleaning a work area in Plant P around a large, permanent hole at the end of each day. An OSHA standard requires guardrails. There are no guardrails around the hole and Sub S employees do not use personal fall protection, although it would be feasible to do so. Sub S has no authority to install guardrails. However, it did ask Employer P, which operates the plant, to install them. P refused to install guardrails.

Analysis: Step 1: Sub S is an exposing employer because its employees are exposed to the fall hazard. Step 2: While Sub S has no authority to install guardrails, it is required to comply with OSHA requirements to the extent feasible. It must take steps to protect its employees and ask the employer that controls the hazard - Employer P - to correct it. Although Sub S asked for guardrails, since the hazard was not corrected, Sub S was responsible for taking reasonable alternative protective steps, such as providing personal fall protection. Because that was not done, Sub S is citable for the violation.

b. Example 4: Unprotected rebar on either side of an access ramp presents an impalement hazard. Sub E, an electrical subcontractor, does not have the authority to cover the rebar. However, several times Sub E asked the general contractor, Employer GC, to cover the rebar. In the meantime, Sub E instructed its employees to use a different access route that avoided most of the uncovered rebar and required them to keep as far from the rebar as possible.

Analysis: Step 1: Since Sub E employees were still exposed to some unprotected rebar, Sub E is an exposing employer. Step 2: Sub E made a good faith effort to get the general contractor to correct the hazard and took feasible measures within its control to protect its employees. Sub E is not citable for the rebar hazard.

D. The Correcting Employer

1. Step 1: Definition: An employer who is engaged in a common undertaking, on the same worksite, as the exposing employer and is responsible for correcting a hazard. This usually occurs where an employer is given the responsibility of installing and/or maintaining particular safety/health equipment or devices.

2. Step 2: Actions taken: The correcting employer must exercise reasonable care in preventing and discovering violations and meet its obligations of correcting the hazard.

   a. Example 5: Employer C, a carpentry contractor, is hired to erect and maintain guardrails throughout a large, 15-story project. Work is proceeding on all floors. C inspects all floors in the morning and again in the afternoon each day. It also inspects areas where material is delivered to the perimeter once the material vendor is finished delivering material to that area. Other subcontractors are required to report damaged/missing guardrails to the general contractor, who forwards those reports to C. C repairs damaged guardrails immediately after finding them and immediately after they are reported. On this project few instances of damaged guardrails have occurred other than where material has been delivered. Shortly after the afternoon inspection of Floor 6, workers moving equipment accidentally damage a guardrail in one area. No one tells C of the damage and C has not seen it. An OSHA inspection occurs at the beginning of the next day, prior to the morning inspection of Floor 6. None of C's own employees are exposed to the hazard, but other employees are exposed.

   Analysis: Step 1: C is a correcting employer since it is responsible for erecting and maintaining fall protection equipment. Step 2: The steps C implemented to discover and correct damaged guardrails were reasonable in light of the amount of activity and size of the project. It exercised reasonable care in preventing and discovering violations; it is not citable for the damaged guardrail since it could not reasonably have known of the violation.

E. The Controlling Employer

1. Step 1: Definition: An employer who has general supervisory authority over the worksite, including the power to correct safety and health violations itself or require others to correct them. Control can be established by contract or, in the absence of explicit contractual provisions, by the exercise of control in practice. Descriptions and examples of different kinds of controlling employers are given below.

2. Step 2: Actions Taken: A controlling employer must exercise reasonable care to prevent and detect violations on the site. The extent of the measures that a controlling employer must implement to satisfy this duty of reasonable care is less than what is required of an employer with respect to protecting its own employees. This means that the controlling employer is not normally required to inspect for hazards as frequently or to have the same level of knowledge of the applicable standards or of trade expertise as the employer it has hired.

3. Factors Relating to Reasonable Care Standard. Factors that affect how frequently and closely a controlling employer must inspect to meet its standard of reasonable care include:

   a. The scale of the project;

   b. The nature and pace of the work, including the frequency with which the number or types of hazards change as the work progresses;

   c. How much the controlling employer knows both about the safety history and safety practices of the employer it controls and about that employer's level of expertise.

   d. More frequent inspections are normally needed if the controlling employer knows that the other employer has a history of non-compliance. Greater inspection frequency may also be needed, especially at the beginning of the project, if the controlling employer had never before worked with this other employer and does not know its compliance history.

   e. Less frequent inspections may be appropriate where the controlling employer sees strong indications that the other employer has implemented effective safety and health efforts. The most important indicator of an effective safety and health effort by the other employer is a consistently high level of compliance. Other indicators include the use of an effective, graduated system of enforcement for non-compliance with safety and health requirements coupled with regular jobsite safety meetings and safety training.

4. Evaluating Reasonable Care. In evaluating whether a controlling employer has exercised reasonable care in preventing and discovering violations, consider questions such as whether the controlling employer:

   a. Conducted periodic inspections of appropriate frequency (frequency should be based on the factors listed in G.3.);

   b. Implemented an effective system for promptly correcting hazards;

   c. Enforces the other employer's compliance with safety and health requirements with an effective, graduated system of enforcement and follow-up inspections.

5. Types of Controlling Employers

   a. Control Established by Contract. In this case, the Employer Has a Specific Contract Right to Control Safety: To be a controlling employer, the employer must itself be able to prevent or correct a violation or to require another employer to prevent or correct the violation. One source of this ability is explicit contract authority. This can take the form of a specific contract right to require another employer to adhere to safety and health requirements and to correct violations the controlling employer discovers.

   (1) Example 6: Employer GH contracts with Employer S to do sandblasting at GH's plant. Some of the work is regularly scheduled maintenance and so is general industry work; other parts of the project involve new work and are considered construction. Respiratory protection is required. Further, the contract explicitly requires S to comply with safety and health requirements. Under the contract GH has the right to take various actions against S for failing to meet contract requirements, including the right to have non-compliance corrected by using other workers and back-charging for that work. S is one of two employers under contract with GH at the work site, where a total of five employees work. All work is done within an existing building: The number and types of hazards involved in S's work do not significantly change as the work progresses. Further, GH has worked with S over the course of several years. S provides periodic and other safety and health training and uses a graduated system of enforcement of safety and health rules. S has consistently had a high level of compliance at its previous jobs and at this site. GH monitors S by a combination of weekly inspections, telephone discussions and a weekly review of S's own inspection reports. GH has a system of graduated enforcement that it has applied to S for the few safety and health violations that had been committed by S in the past few years. Further, due to respirator equipment problems S violates respiratory protection requirements two days before GH's next scheduled inspection of S. The next day there is an OSHA inspection. There is no notation of the equipment problems in S's inspection reports to GH and S made no mention of it in its telephone discussions.

   Analysis: Step 1: GH is a controlling employer because it has general supervisory authority over the worksite, including contractual authority to correct safety and health violations. Step 2: GH has taken reasonable steps to try to make sure that S meets safety and health requirements. Its inspection frequency is appropriate in light of the low number of workers at the site, lack of significant changes in the nature of the work and types of hazards involved, GH's knowledge of S's history of compliance and its effective safety and health efforts on this job. GH has exercised reasonable care and is not citable for this condition.

   (2) Example 7: Employer GC contracts with Employer P to do painting work. GC has the same contract authority over P as Employer GH had in Example 6. GC has never before worked with P. GC conducts inspections that are sufficiently frequent in light of the factors listed above in (G)(3). Further, during a number of its inspections, GC finds that P has violated fall protection requirements. It points the violations out to P during each inspection but takes no further actions.

   Analysis: Step 1: GC is a controlling employer since it has general supervisory authority over the site, including a contractual right of control over P. Step 2: GC took adequate steps to meet its obligation to discover violations. However, it failed to take reasonable steps to require P to correct hazards since it lacked a graduated system of enforcement. A citation to GC for the fall protection violations is appropriate.

(3) Example 8: Employer GC contracts with Sub E, an electrical subcontractor. GC has full contract authority over Sub E, as in Example 6. Sub E installs an electric panel box exposed to the weather and implements an assured equipment grounding conductor program, as required under the contract. It fails to connect a grounding wire inside the box to one of the outlets. This incomplete ground is not apparent from a visual inspection. Further, GC inspects the site with a frequency appropriate for the site in light of the factors discussed above in (G)(3). It saw the panel box but did not test the outlets to determine if they were all grounded because Sub E represents that it is doing all of the required tests on all receptacles. GC knows that Sub E has implemented an effective safety and health program. From previous experience it also knows Sub E is familiar with the applicable safety requirements and is technically competent. GC had asked Sub E if the electrical equipment is OK for use and was assured that it is.

Analysis: Step 1: GC is a controlling employer since it has general supervisory authority over the site, including a contractual right of control over Sub E. Step 2: GC exercised reasonable care. It had determined that Sub E had technical expertise, safety knowledge and had implemented safe work practices. It conducted inspections with appropriate frequency. It also made some basic inquiries into the safety of the electrical equipment. Under these circumstances GC was not obligated to test the outlets itself to determine if they were all grounded. It is not citable for the grounding violation.

b. Control Established by a Combination of Other Contract Rights: Where there is no explicit contract provision granting the right to control safety, or where the contract says the employer does not have such a right, an employer may still be a controlling employer. The ability of an employer to control safety in this circumstance can result from a combination of contractual rights that, together, give it broad responsibility at the site involving almost all aspects of the job. Its responsibility is broad enough so that its contractual authority necessarily involves safety. The authority to resolve disputes between subcontractors, set schedules and determine construction sequencing are particularly significant because they are likely to affect safety. (Note: citations should only be issued in this type of case after consulting with the Regional Solicitor's office).

(1) Example 9: Construction manager M is contractually obligated to: set schedules and construction sequencing, require subcontractors to meet contract specifications, negotiate with trades, resolve disputes between subcontractors, direct work and make purchasing decisions, which affect safety. However, the contract states that M does not have a right to require compliance with safety and health requirements. Further, Subcontractor S asks M to alter the schedule so that S would not have to start work until Subcontractor G has completed installing guardrails. M is contractually responsible for deciding whether to approve S's request.

Analysis: Step 1: Even though its contract states that M does not have authority over safety, the combination of rights actually given in the contract provides broad responsibility over the site and results in the ability of M to direct actions that necessarily affect safety. For example, M's contractual obligation to determine whether to approve S's request to alter the schedule has direct safety implications. M's decision relates directly to whether S's employees will be protected from a fall hazard. M is a controlling employer. Step 2: In this example, if M refused to alter the schedule, it would be citable for the fall hazard violation.

(2) Example 10: Employer ML's contractual authority is limited to reporting on subcontractors' contract compliance to owner/developer O and making contract payments. Although it reports on the extent to which the subcontractors are complying with safety and health infractions to O, ML does not exercise any control over safety at the site.

Analysis: Step 1: ML is not a controlling employer because these contractual rights are insufficient to confer control over the subcontractors and ML did not exercise control over safety. Reporting safety and health infractions to another entity does not, by itself (or in combination with these very limited contract rights), constitute an exercise of control over safety. Step 2: Since it is not a controlling employer it had no duty under the OSH Act to exercise reasonable care with respect to enforcing the subcontractors' compliance with safety; there is therefore no need to go to Step 2.

c. Architects and Engineers: Architects, engineers, and other entities are controlling employers only if the breadth of their involvement in a construction project is sufficient to bring them within the parameters discussed above.

(1) Example 11: Architect A contracts with owner O to prepare contract drawings and specifications, inspect the work, report to O on contract compliance, and to certify completion of work. A has no authority or means to enforce compliance, no authority to approve/reject work and does not exercise any other authority at the site, although it does call the general contractor's attention to observed hazards noted during its inspections.

Analysis: Step 1: A's responsibilities are very limited in light of the numerous other administrative responsibilities necessary to complete the project. It is little more than a supplier of architectural services and conduit of information to O. Its responsibilities are insufficient to confer control over the subcontractors and it did not exercise control over safety. The responsibilities, it does have, are insufficient to make it a controlling employer. Merely pointing out safety violations did not make it a controlling employer. Note: In a circumstance such as this it is likely that broad control over the project rests with another entity. Step 2: Since A is not a controlling employer it had no duty under the OSH Act to exercise reasonable care with respect to enforcing the subcontractors' compliance with safety; there is therefore no need to go to Step 2.

(2) Example 12: Engineering firm E has the same contract authority and functions as in Example 9.

Analysis: Step 1: Under the facts in Example 9, E would be considered a controlling employer. Step 2: The same type of analysis described in Example 9 for Step 2 would apply here to determine if E should be cited.

d. Control Without Explicit Contractual Authority. Even where an employer has no explicit contract rights with respect to safety, an employer can still be a controlling employer if, in actual practice, it exercises broad control over subcontractors at the site (see Example 9). Note: Citations should only be issued in this type of case after consulting with the Regional Solicitor's office.

(1) Example 13: Construction manager MM does not have explicit contractual authority to require subcontractors to comply with safety requirements, nor does it explicitly have broad contractual authority at the site. However, it exercises control over most aspects of the subcontractors' work anyway, including aspects that relate to safety.

Analysis: Step 1: MM would be considered a controlling employer since it exercises control over most aspects of the subcontractor's work, including safety aspects. Step 2: The same type of analysis on reasonable care described in the examples in (G)(5)(a) would apply to determine if a citation should be issued to this type of controlling employer.

F. Multiple Roles

1. A creating, correcting or controlling employer will often also be an exposing employer. Consider whether the employer is an exposing employer before evaluating its status with respect to these other roles.

2. Exposing, creating and controlling employers can also be correcting employers if they are authorized to correct the hazard.

EXHIBIT 14.6 CROSS REFERENCES FOR OSHA AND VOLUNTARY CONSENSUS ELECTRICAL STANDARDS

These listings have been developed to aid personnel in identifying what OSHA 1910 and 1926 regulatory standards and existing consensus standards are applicable to specific tasks on electrical equipment and systems. The consensus standards that are mentioned include "NFPA 70E, Electrical Safety for Employee Workplaces"; "NFPA 70, National Electrical Code (NEC)"; and "ANSI C2, National Electrical Safety Code (NESC)". The format of these cross references utilizes NFPA 70E 2000 Edition (table of contents) as the beginning reference and then matches other regulatory and consensus standards to NFPA 70E requirements.

PART I INSTALLATION SAFETY REQUIREMENTS

CHAPTER 1 GENERAL REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

1-1 GENERAL & 1-2 APPROVAL: NFPA 70E-Part I, Ch. 1-1
NEC 80.19(F) NEC 90 NEC 110.2 NEC Art. 100 NEC 110.3 (B) OSHA 1910.303 (a) OSHA 1926.403 (a)

1-2 APPROVAL: NFPA 70E-Part I, Chapter 1-2

1-3 EXAMINATION, IDENTIFICATION, INSTALLATION, & USE OF EQUIPMENT: NFPA 70E-Part I, Ch. 1-3
NEC 110.3 (A) NEC 110.3 (B) OSHA 1910.303 (b)(1) & (2) OSHA 1926.403 (b) (1) & (2)

1-3.1 EXAMINATION: NFPA 70E-Part I, Ch. 1-3.1
NEC 110.3 (A) OSHA 1910.303 (b)(1) OSHA 1926.403 (b) (1)

1-3.2 INSTALLATION AND USE: NFPA 70E-Part I, Ch. 1-3.2
NEC 110.3 (B) OSHA 1910.303 (b) (2) OSHA 1926.403 (b) (2)

1-3.3 INSULATION INTEGRITY: NFPA 70E-Part I, Ch. 1-3.3
NEC 110.7 NEC 300.3 (C)(1)

1-3.4 INTERRUPTING RATING: NFPA 70E-Part I, Ch. 1-3.4
NEC 110.9 NEC 110.10 NEC 240.1, FPN NEC 250.1 OSHA 1926.403 (c)

1-3.5 CIRCUIT IMPEDANCE & OTHER CHARACTERISTICS: NFPA 70E-Part I, Ch. 1-3.5
NEC 110.9 NEC 110.10 NEC 240.1, FPN NEC 250.1

1-3.6 DETERIORATING AGENTS: NFPA 70E-Part I, Ch. 1-3.6
NEC 110.11 NEC 300.6 NEC 310.9

1-3.7 MECHANICAL EXECUTION OF WORK: NFPA 70E-Part I, Ch. 1-3.7
NEC 110.12

UNUSED OPENINGS: NFPA 70E-Part I, Ch. 1-3.7.1
NEC 110.12(A)
SUBSURFACE ENCLOSURES: NFPA 70E-Part I, Ch. 1-3.7.2
NEC 110.12 (B)
INTEGRITY OF ELECTRICAL EQUIPMENT & CONNECTIONS: NFPA 70E-Part I, Ch. 1-3.7.3
NEC 110.12 (C)

1-3.8 MOUNTING AND COOLING OF EQUIPMENT: NFPA 70E-Part I, Ch. 1-3.8.1 & 2
NEC 110.13 (A) & (B)

1-4 ELECTRICAL CONNECTIONS: NFPA 70E-Part I, Ch. 1-4
NEC 110.14

1-4.1 TERMINALS: NEC 110.14(A) NFPA 70E-Part I, Ch. 1-4.1
1-4.2 SPLICES: NEC 110.14(B) NFPA 70E-Part I, Ch. 1-4.1
OSHA 1910.303 (c) OSHA 1926.403 (e)

1-5 ARCING PARTS: NFPA 70E-Part I, Ch. 1-5
NEC 110.18 OSHA 1910.303 (d) OSHA 1926.403 (f)

1-6 MARKING: NFPA 70E-Part I, Ch. 1-6
NEC 110.21 OSHA 1910.303 (e) OSHA 1926.403 (g)

1-7 IDENTIFICATION OF DISCONNECTING MEANS: NFPA 70E-Part I, Ch. 1-7
NEC 110.22 NEC 408.13, FPN NEC 230.70 (B) OSHA 1910.303 (f) OSHA 1926.403 (h)

1-8 600 VOLTS, NOMINAL, OR LESS: NFPA 70E-Part I, Ch. 1-8
NEC 110.26(A) OSHA 1910.303 (g)(1)(i) OSHA 1926.403 (i)(1)(i)

1-8.1 SPACE ABOUT ELECTRICAL EQUIPMENT: NFPA 70E-Part I, Ch. 1-8.1
NEC 110.16 OSHA 1910.303 (g)(1) OSHA 1926.403 (i)(1)

WORKING SPACE: NFPA 70E-Part I, Ch. 1-8.1.1 & Table 1-8.1.1
NEC 90.4 NEC 110.26(A) & Table 110.26(A) OSHA 1910.303 (g)(1)(i) & Table S-1
OSHA 1926.403 (i)(1)(i) & Table K-1

DEPTH OF WORKING SPACE: NFPA 70E-Part I, Ch. 1-8.1.1.1
WIDTH OF WORKING SPACE: NFPA 70E-Part I, Ch. 1-8.1.1.2
HEIGHT OF WORKING SPACE: NFPA 70E-Part I, Ch. 1-8.1.1.3

CLEAR SPACES: NFPA 70E-Part I, Ch. 1-8.1.2
NEC 110.26(B) OSHA 1910.303 (g)(1)(ii) OSHA 1926.403 (i)(1)(ii)
ACCESS AND ENTRANCE TO WORKING SPACE: NFPA 70E-Part I, Ch. 1-8.1.3
NEC 110.26(C) OSHA 1910.303 (g)(1)(iii) OSHA 1926.403 (i)(1)(iii)
ILLUMINATION: NFPA 70E-Part I, Ch. 1-8.1.4
NEC 110.26(D) OSHA 1910.303 (g)(1)(v)
HEADROOM: NFPA 70E-Part I, Ch. 1-8.1.5
NEC 110.26(E) OSHA 1910.303 (g)(1)(iv) OSHA 1926.403 (i)(1)(v)
DEDICATED EQUIPMENT SPACE: NFPA 70E-Part I, Ch. 1-8.1.6
INDOOR: NFPA 70E-Part I, Ch. 1-8.1.6.1

a. DEDICATED EQUIPMENT SPACE
c. FOREIGN SYSTEMS
d. SPRINKLER PROTECTION
e. SUSPENDED CEILINGS

OUTDOOR: NFPA 70E-Part I, Ch. 1-8.1.6.2

1-8.2 GUARDING OF LIVE PARTS: NFPA 70E-Part I, Ch. 1-8.2
NEC 110.27 (A)(1) OSHA 1910.303 (g)(2)(i)(A) OSHA 1926.403 (i)(2)(i)(A)

LIVE PARTS GUARDED AGAINST ACCIDENTAL CONTACT: NFPA 70E-Part I, Ch. 1-8.2.1
NEC 110.27 (A)(1)(2)(3)(4) OSHA 1910.303 (g)(2)(i)(A)(B)(C) OSHA 1926.403 (i)(2)(i)(A)(B)(C)
PREVENT PHYSICAL DAMAGE: NFPA 70E-Part I, Ch. 1-8.2.2
NEC 110.27 (B) OSHA 1910.303 (g)(2)(ii) OSHA 1926.403 (i)(2)(ii)
WARNING SIGNS: NFPA 70E-Part I, Ch. 1-8.2.3
NEC 110.27 (C) OSHA 1910.303 (g)(2)(iii) OSHA 1926.403 (i)(2)(iii)

1-9 OVER 600 VOLTS, NOMINAL: NFPA 70E-Part I, Ch. 1-9
NEC 110.30 OSHA 1910.303 (h)(1) OSHA 1926.403 (j)(1)

1-9.1 GENERAL: NFPA 70E-Part I, Ch. 1-9.1
NEC 110.30 OSHA 1910.303 (h)(1) OSHA 1926.403 (j)(1)

1-9.2 ENCLOSURES FOR ELECTRICAL INSTALLATIONS: NFPA 70E-Part I, Ch. 1-9.2
NEC 110.31 OSHA 1910.303 (h)(2) OSHA 1926.403 (j)(2)
NEC 110.31(C) OSHA 1910.303 (h)(2)(ii) OSHA 1926.403 (j)(2)(ii)
NEC 110.31(B)(2) OSHA 1910.303 (h)(2(i)) OSHA 1926.403 (j)(2)(i)

INDOOR INSTALLATIONS: NFPA 70E-Part I, Ch. 1-9.2.1
IN PLACES ACCESSIBLE TO UNQUALIFIED PERSONS: NFPA 70E-Part I, Ch. 1-9.2.1.1
IN PLACES ACCESSIBLE TO QUALIFIED PERSONS: NFPA 70E-Part I, Ch. 1-9.2.1.2

OUTDOOR INSTALLATIONS: NFPA 70E-Part I, Ch. 1-9.2.2
IN PLACES ACCESSIBLE TO UNQUALIFIED PERSONS: NFPA 70E-Part I, Ch. 1-9.2.2.1
IN PLACES ACCESSIBLE TO QUALIFIED PERSONS: NFPA 70E-Part I, Ch. 1-9.2.2.2

1-9.3 WORK SPACE ABOUT EQUIPMENT: NFPA 70E-Part I, Ch. 1-9.3
NEC 110.32 & TABLE 110.34(A) OSHA 1910.303 (h)(3) & TABLE S-2 OSHA 1926.403 (j)(3)

1-9.4 ENTRANCE AND ACCESS TO WORK SPACE: NFPA 70E-Part I, Ch. 1-9.4
NEC 110.33(A) & (B) OSHA 1910.303 (h)(4) OSHA 1926.403 (j)(4)

ENTRANCE: NFPA 70E-Part I, Ch. 1-9.4.1
ACCESS: NFPA 70E-Part I, Ch. 1-9.4.2

1-9.5 WORK SPACE AND GUARDING: NFPA 70E-Part I, Ch. 1-9.5 & TABLE 1.9.5.1
NEC 110.-34(A) OSHA 1910.303 (h)(3)(i) OSHA 1926.403 (j)(3)(i)

WORKING SPACE: NFPA 70E-Part I, Ch. 1-9.5.1
SEPARATION FROM LOW-VOLTAGE EQUIPMENT: NFPA 70E-Part I, Ch. 1-9.5.2
NEC 110.34(B) NEC 110.34(B), Exhibit
LOCKED ROOMS OR ENCLOSURES: NFPA 70E-Part I, Ch. 1-9.5.3
NEC 110.34(C) & Exhibit NEC 230.205(C) NEC 314.72(E)
ILLUMINATION: NFPA 70E-Part I, Ch. 1-9.5.4
NEC 110.34(D) OSHA 1910.303 (h)(3)(ii) OSHA 1926.403 (j)(3)(ii)
ELEVATION OF UNGUARDED LIVE PARTS: NFPA 70E-Part I, Ch. 1-9.5.5 & TABLE
NEC 110.34(E) OSHA 1910.303 (h)(3)(iii) OSHA 1926.403 (j)(3)(iii)
PROTECTION OF SERVICE EQUIPMENT, METAL-ENCLOSED
POWER SWITCHGEAR, AND INDUSTRIAL CONTROL ASSEMBLIES: NFPA 70E-Part I, Ch. 1-9.5.6
NEC 110.34(F)

CHAPTER 2 WIRING DESIGN AND PROTECTION

2-1 USE AND IDENTIFICATION OF GROUNDED & GROUNDING CONDUCTORS: NFPA 70E-Part I, Ch.2-1

NEC 200.6 NEC 310.12 OSHA 1910.304(a) OSHA 1926.404(a)

2-1.1 IDENTIFICATION OF CONDUCTORS: NFPA 70E-Part I, Ch.2-1.1
NEC 200-6 NEC 310.12 OSHA 1910.304(a)(1)
OSHA 1926.404(a)(1)

2-1.2 POLARITY OF CONNECTIONS: NFPA 70E-Part I, Ch.2-1.2
NEC 200.11 OSHA 1910.304(a)(2) OSHA 1926.404(a)(2)

2-2 BRANCH CIRCUITS: NFPA 70E-Part I, Ch.2-2
NEC Art. 100 (Branch-circuits) NEC 210 NEC 210.4(A) NEC 210.19(A) NEC 210.20

2-2.1 IDENTIFICATION OF MULTIWIRE BRANCH-CIRCUITS: NFPA 70E-Part I, Ch.2-2.1
NEC 210.4(D)

2-2.2 RECEPTACLES AND CORD CONNECTORS: NFPA 70E-Part I, Ch.2-2.2
NEC 406

GROUNDING TYPE: NFPA 70E-Part I, Ch.2-2.2.1
NEC 210.7(A) NEC Art. 100 NEC 250.50
TO BE GROUNDED: NFPA 70E-Part I, Ch.2-2.2.2 & Exhibits 1 & 2
NEC 210.7(B)
METHODS OF GROUNDING: NFPA 70E-Part I, Ch.2-2.2.3

REPLACEMENTS: NFPA 70E-Part I, Ch.2-2.2.4

CORD- AND PLUG- CONNECTED EQUIPMENT: NFPA 70E-Part I, Ch.2-2.2.5
NEC 210.23(A)(1)

NONINTERCHANGEABLE TYPES: NFPA 70E-Part I, Ch.2-2.2.6

2-2.3 IDENTIFICATION OF UNGROUNDED CONDUCTORS: NFPA 70E-Part I, Ch.2-2.3
NEC 210.4(D)

2-2.4 GROUND-FAULT CIRCUIT-INTERRUPTER PROTECTION FOR PERSONNEL: NFPA 70E-Part I, Ch.2-2.4
NEC Art. 100 NEC 210.8

OTHER THAN DWELLING UNITS: NFPA 70E-Part I, Ch.2-2.4.1
GROUND-FAULT PROTECTION FOR PERSONNEL: NFPA 70E-Part I, Ch.2-2.4.2
RECEPTACLE OUTLETS: NFPA 70E-Part I, Ch.2-2.4.2.1
USE OF OTHER OUTLETS: NFPA 70E-Part I, Ch.2-2.4.2.2
GFCI PROTECTION OF PERSONNEL: NFPA 70E-Part I, Ch.2-2.4.2.2.1
ASSURED GROUNDING PROGRAMS: NFPA 70E-Part I, Ch.2-2.4.2.2.2

2-2.5 OUTLET DEVICES: NFPA 70E-Part I, Ch.2-2.5
NEC 210.21 OSHA 1910.304(b)(2) OSHA 1926.404(b)(2)
(a) LAMPHOLDERS
(b) RECEPTACLES
TABLE 2-2.5(b)(2) MAXIMUM CORD- AND PLUG-CONNECTED LOAD TO RECEPTACLE
TABLE 2-2.5(b)(3) RECEPTACLE RATINGS FOR VARIOUS SIZE CIRCUITS

2-2.6 CORD CONNECTIONS: NFPA 70E-Part I, Ch.2-2.6
NEC 210.50(B)

2-3 OUTSIDE BRANCH CIRCUIT, FEEDER, & SERVICE CONDUCTORS, 600 VOLTS, NOMINAL, OR LESS: NFPA 70E-Part I, Ch.2-3

2-3.1 CONDUCTORS ON POLES: NFPA 70E-Part I, Ch.2-3.1
NEC 225.14(D) OSHA 1910.304(c)(1) OSHA 1926.404(c)(1)(i)

2-3.2 VERTICAL CLEARANCE FROM GROUND: NFPA 70E-Part I, Ch.2-3.2
NEC 225.18 NEC 230.24(B) OSHA 1910.304(c)(2)(i)-(iv) OSHA 1926.404(c)(1)(ii)(A)-(D)

2-3.3 CLEARANCE FROM BUILDING OPENINGS: NFPA 70E-Part I, Ch.2-3.3
NEC 230.9 OSHA 1910.304(c)(3) OSHA 1926.404(c)(i)(iii)

2-3.4 CLEARANCES FROM BUILDINGS FOR CONDUCTORS OF NOT OVER 600 VOLTS, NOMINAL: NFPA 70E-Part I, Ch.2-3.4
NEC 225.19(A), Ex. 1 thru 4 OSHA 1910.304(c)(4)(i) & (ii) OSHA 1926.404(c)(1)(iv)(A)-(D)

ABOVE ROOFS: NEC 230.24(A) NFPA 70E-Part I, Ch.2-3.4.1

2-3.5 LOCATION OF OUTDOOR LAMPS: NFPA 70E-Part I, Ch.2-3.4.2
NEC 225.25 OSHA 1910.304(c)(5) OSHA 1926.404(c)(2)

2-4 SERVICES: NFPA 70E-Part I, Ch.2-4
NEC 230.70(A); (B); (C) OSHA 1910.304(d) OSHA 1926.404(d)

2-4.1 SERVICE EQUIPMENT- DISCONNECTING MEANS: NFPA 70E-Part I, Ch.2-4.1
NEC 230.70(A); (B); (C) OSHA 1910.304(d)(1)(i) OSHA 1926.404(d)(1)(i)

GENERAL: NFPA 70E-Part I, Ch.2-4.1.1
(a) LOCATION (b) MARKING (c) SUITABLE FOR USE

2-4.2 SERVICES EXCEEDING 600 VOLTS, NOMINAL: NFPA 70E-Part I, Ch.2-4.2
NEC 230.200 OSHA 1910.304(d)(2) OSHA 1926.404(d)(2)

GUARDING: NFPA 70E-Part I, Ch.2-4.2.1
NEC 230.202 TABLE 230.51(C) OSHA 1910.304(d)(2)(i) OSHA 1926.404(d)(2)(i)
WARNING SIGNS: NFPA 70E-Part I, Ch.2-4.2.2
OSHA 1910.304(d)(2)(ii) OSHA 1926.404(d)(2)(ii)

2-5 OVERCURRENT PROTECTION: NFPA 70E-Part I, Ch.2-5
NEC 240.1 & 2 OSHA 1910.304(e)(1) OSHA 1926.404(e)(1)

2-5.1 PROTECTION OF CONDUCTORS AND EQUIPMENT: NFPA 70E-Part I, Ch.2-5.1
NEC 210.20 NEC 240.1 & 2 OSHA 1910.304(e)(1)(i) OSHA 1926.404(e)(1)(i)

GROUNDED CONDUCTORS: NFPA 70E-Part I, Ch.2-5.1.2
NEC 240.22 NEC 430.36 OSHA 1910.304(e)(1)(ii) OSHA 1926.404(e)(1)(ii)
DISCONNECTING MEANS FOR FUSES: NFPA 70E-Part I, Ch.2-5.1.3
NEC 240.40 OSHA 1910.304(e)(1)(iii) OSHA 1926.404(e)(1)(iii)
ARCING OR SUDDENLY MOVING PARTS: NFPA 70E-Part I, Ch.2-5.1.4
NEC 240.41 OSHA 1910.304(e)(1)(v) OSHA 1926.404(e)(1)(v)
(a) LOCATION (b) SUDDENLY MOVING PARTS
CIRCUIT BREAKERS: NFPA 70E-Part I, Ch.2-5.1.5
NEC 240.80 NEC 240.83 NEC 240.85 OSHA 1910.304(e)(1)(vi) OSHA 1926.404(e)(1)(vi)
USED AS SWITCHES: NFPA 70E-Part I, Ch.2-5.1.5.1
APPLICATIONS: NFPA 70E-Part I, Ch.2-5.1.5.2

2-5.2 OVERCURRENT PROTECTION OVER 600 VOLTS, NOMINAL: NFPA 70E-Part I, Ch.2-5.2
NEC 240.100 NEC 240.101

FEEDERS AND BRANCH CIRCUITS: NFPA 70E-Part I, Ch.2-5.2.1
OVERCURRENT PROTECTION: NFPA 70E-Part I, Ch.2-5.2.1.1
(a) OVERCURRENT RELAYS AND CURRENT TRANSFORMERS
(b) FUSES PROTECTIVE DEVICES: NFPA 70E-Part I, Ch.2-5.2.1.2
CONDUCTOR PROTECTION: NFPA 70E-Part I, Ch.2-5.2.1.3

ADDITIONAL REQUIREMENTS FOR FEEDERS: NFPA 70E-Part I, Ch.2-5.2.2
RATING OR SETTING OF OVERCURRENT PROTECTIVE DEVICES: NFPA 70E-Part I, Ch. 2-5.2.2.1
FEEDER TAPS: NFPA 70E-Part I, Ch. 2-5.2.2.2

2-6 GROUNDING: NFPA 70E-Part I, Ch.2.6
NEC 250.1 OSHA 1910.304(f) OSHA 1926.404(f)

2-6.1 SYSTEMS TO BE GROUNDED: NFPA 70E-Part I, Ch.2-6.1
NEC 250.3 OSHA 1910.304(f)(1)(i) OSHA 1926.404(f)(1)(i)
SYSTEMS TO BE GROUNDED: NFPA 70E-Part I, Ch.2-6.1.1
NEC 250.3 OSHA 1910.304(f)(1)(i) OSHA 1926.404(f)(1)(i)
SYSTEMS TO BE GROUNDED: NFPA 70E-Part I, Ch.2-6.1.2
NEC 250.4(A) OSHA 1910.304(f)(1)(ii) OSHA 1926.404(f)(1)(ii)
SYSTEMS TO BE GROUNDED: NFPA 70E-Part I, Ch.2-6.1.3
NEC 250.4(A) OSHA 1910.304(f)(1)(iii) OSHA 1926.404(f)(1)(iii)
SYSTEMS TO BE GROUNDED: NFPA 70E-Part I, Ch.2-6.1.4
NEC 250.4(A) OSHA 1910.304(f)(1)(iv) OSHA 1926.404(f)(1)(iv)
SYSTEMS NOT TO BE GROUNDED: NFPA 70E-Part I, Ch.2-6.1.5
NEC 250.4(B) OSHA 1910.304(f)(1)(v) OSHA 1926.404(f)(1)(v)
ALTERNATING-CURRENT SYSTEMS OF 1KV AND OVER: NFPA 70E-Part I, Ch.2-6.1.6
NEC 250(C)
PORTABLE AND VEHICLE-MOUNTED GENERATORS: NFPA 70E-Part I, Ch.2-6.1.7
NEC 250.34(A) & (B) & (C) NEC 250.36(B) OSHA 1926.404(f)(3)
PORTABLE GENERATORS: NFPA 70E-Part I, Ch.2-6.1.7.1
VEHICLE-MOUNTED GENERATORS: NFPA 70E-Part I, Ch.2-6.1.7.2
NEUTRAL CONDUCTOR BONDING: NFPA 70E-Part I, Ch.2-6.1.7.3

2-6.2 GROUNDING CONNECTIONS: NFPA 70E-Part I, Ch.2-6.2
NEC 250
GROUNDING CONNECTIONS: NFPA 70E-Part I, Ch.2-6.2.1
OSHA 1910.304(f)(3)(i) OSHA 1926.404(f)(5)(i)
GROUNDING CONNECTIONS: NFPA 70E-Part I, Ch.2-6.2.2
OSHA 1910.304(f)(3)(ii) OSHA 1926.404(f)(5)(ii)
GROUNDING CONNECTIONS: NFPA 70E-Part I, Ch.2-6.2.3
OSHA 1910.304(f)(3)(iii)

2-6.3 GROUNDING PATH: NFPA 70E-Part I, Ch.2-6.3
NEC 250.68(B) OSHA 1910.304(f)(4) OSHA 1926.404(f)(6)

2-6.4 SUPPORTS, ENCLOSURES, & EQUIPMENT TO BE GROUNDED: NFPA 70E-Part I, Ch.2-6.4
OSHA 1910.304(f)(5) OSHA 1926.404(f)(7)

SUPPORTS AND ENCLOSURES FOR CONDUCTORS: NFPA 70E-Part I, Ch.2-6.4.1
OSHA 1910.304(f)(5)(i)(A) OSHA 1926.404(f)(7)(i)(A)
SERVICE EQUIPMENT ENCLOSURES: NFPA 70E-Part I, Ch.2-6.4.2
OSHA 1910.304(f)(5)(ii) OSHA 1926.404(f)(7)(ii)
FRAMES OF RANGES AND CLOTHES DRYERS: NFPA 70E-Part I, Ch.2-6.4.3
OSHA 1910.304(f)(5)(iii)
FIXED EQUIPMENT: NFPA 70E-Part I, Ch.2-6.4.4
NEC 250.110 OSHA 1910.304(f)(5)(iv)(A)-(F) OSHA 1926.404(f)(7)(iii)(A)-(F)
EQUIPMENT CONNECTED BY CORD-AND-PLUG: NFPA 70E-Part I, Ch.2-6.4.5
NEC 250.138 OSHA 1910.304(f)(5)(v) OSHA 1926.404(f)(7)(vi)
NONELECTRICAL EQUIPMENT: NFPA 70E-Part I, Ch.2-6.4.6
NEC 250.114 OSHA 1910.304(f)(5)(vi) OSHA 1926.404(f)(7)(v)

2-6.5 METHODS OF GROUNDING FIXED EQUIPMENT: NFPA 70E-Part I, Ch.2-6.5
NEC 250.50 NEC 250.58 OSHA 1910.304(f)(6); (i); (ii) OSHA 1926.404(f)(8)(i); (ii); (iii)

2-6.6 GENERAL BONDING: NFPA 70E-Part I, Ch.2-6.6
NEC 250.90 OSHA 1926.404(f)(9)

2-6-7 GROUNDING OF SYSTEMS & CIRCUITS OF 1 KV & OVER(HIGH VOLTAGE): NFPA 70E-Part I, Ch.2-6.7
NEC 250.180 OSHA 1910.304(f)(7)(i) OSHA 1926.404(f)(11)(i)

GENERAL: NFPA 70E-Part I, Ch.2-6.7.1
GROUNDING OF SYSTEMS SUPPLYING PORTABLE EQUIPMENT: NFPA 70E-Part I, Ch.2-6.7.2
NEC 250.188 OSHA 1910.304(f)(7)(ii) OSHA 1926.404(f)(11)(ii)
GROUNDING OF EQUIPMENT: NFPA 70E-Part I, Ch.2-6.7.3
NEC 250.190 OSHA 1910.304(f)(7)(iii) OSHA 1926.404(f)(11)(iii)

CHAPTER 3 WIRING METHODS, COMPONENTS, AND EQUIPMENT FOR GENERAL USE

3-1 WIRING METHODS: NFPA 70E-Part I, Ch.3-1
NEC 300 OSHA 1910.305(a)(1) OSHA 1926.405(a)(1)

3-1.1 BONDING OTHER ENCLOSURES: NFPA 70E-Part I, Ch.3-1.1

GENERAL: NFPA 70E-Part I, Ch.3-1.1.1
OSHA 1910.305(a)(1) OSHA 1926.405(a)(1)
ISOLATED GROUNDING CIRCUITS: NFPA 70E-Part I, Ch.3-1.1.2
DUCTS FOR DUST, LOOSE STOCK, OR VAPOR REMOVAL: NFPA 70E-Part I, Ch.3-1.1.3
NEC 300.22(A) OSHA 1910.305(a)(1)(ii) OSHA 1926.405(a)(1)(ii)

3-1.2 TEMPORARY WIRING: NFPA 70E-Part I, Ch.3-1.2
NEC 527.1 OSHA 1910.305(a)(2) OSHA 1926.405(a)(2)

USES PERMITTED, 600 VOLTS, NOMINAL, OR LESS: NFPA 70E-Part I, Ch.3-1.2.1
NEC 527.3 OSHA 1910.305(a)(2)(i) OSHA 1926.405(a)(2)(i)

(a) DURING THE PERIOD OF CONSTRUCTION
(b) 90 DAYS
(c) EMERGENCIES AND TESTS
(d) REMOVAL

USES PERMITTED, 600 VOLTS, NOMINAL: NFPA 70E-Part I, Ch.3-1.2.2
OSHA 1910.305(a)(2)(ii)
GENERAL REQUIREMENTS FOR TEMPORARY WIRING: NFPA 70E-Part I, Ch.3-1.2.3
NEC 527.4 OSHA 1910.305(a)(2)(iii)A-G OSHA 1926.405(a)(2)(ii)A-J

FEEDERS: NFPA 70E-Part I, Ch.3-1.2.3.1
BRANCH CIRCUITS: NFPA 70E-Part I, Ch.3-1.2.3.2
RECEPTACLES: NFPA 70E-Part I, Ch.3-1.2.3.3
EARTH RETURNS: NFPA 70E-Part I, Ch.3-1.2.3.4
DISCONNECTING MEANS: NFPA 70E-Part I, Ch.3-1.2.3.5
LAMP PROTECTION: NFPA 70E-Part I, Ch.3-1.2.3.6
SPLICES: NFPA 70E-Part I, Ch.3-1.2.3.7
PROTECTION FROM ACCIDENTAL DAMAGE: NFPA 70E-Part I, Ch.3-1.2.3.8
TERMINATION(S) AT DEVICES: NFPA 70E-Part I, Ch.3-1.2.3.9
SUPPORT: NFPA 70E-Part I, Ch.3-1.2.3.10

3-1.3 CABLE TRAYS: NFPA 70E-Part I, Ch.3-1.3
NEC 392.2 OSHA 1910-305(a)(3)

USES PERMITTED: NFPA 70E-Part I, Ch.3-1.3.1
NEC 392.3 OSHA 1910-305(a)(3)(i)(a)

WIRING METHODS: NFPA 70E-Part I, Ch.3-1.3.2

IN INDUSTRIAL ESTABLISHMENTS: NFPA 70E-Part I, Ch.3-1.3.3

(a) SINGLE CONDUCTORS
(b) MULTICONDUCTOR
(c) EQUIPMENT GROUNDING CONDUCTORS
(d) HAZARDOUS (CLASSIFIED) LOCATIONS
(e) NONMETALLIC CABLE TRAY

USES NOT PERMITTED: NFPA 70E-Part I, Ch.3-1.3.4
NEC 392.4 OSHA 1910-305(a)(3)(ii)

3-1.4 OPEN SPACE WIRING ON INSULATORS: NFPA 70E-Part I, Ch.3-1.4
NEC 398.1 OSHA 1910.305(a)(4)

USES PERMITTED: NFPA 70E-Part I, Ch.3-1.4.1
NEC 398.10 OSHA 1910.305(a)(4)(i)
CONDUCTOR SUPPORTS: NFPA 70E-Part I, Ch.3-1.4.2
NEC 398.30 OSHA 1910.305(a)(4)(ii)
CONDUCTOR SIZES SMALLER THAN NO. 8: NFPA 70E-Part I, Ch.3-1.4.2.1
FLEXIBLE NONMETALLIC TUBING: NFPA 70E-Part I, Ch.3-1.4.3
NEC 398.17 OSHA 1910.305(a)(4)(iii)
THROUGH WALLS, FLOORS, WOOD CROSS MEMBERS, ETC: NFPA 70E-Part I, Ch.3-1.4.4
NEC 398.17 OSHA 1910.305(a)(4)(iv)
PROTECTION FROM PHYSICAL DAMAGE: NFPA 70E-Part I, Ch.3-1.4.5
NEC 398.15(C) OSHA 1910.305(a)(4)(v)

3-2 CABINETS, CUTOUT BOXES, AND METER SOCKET ENCLOSURES: NFPA 70E-Part I, Ch.3-2
NEC 312.1 OSHA 1910.305(b) OSHA 1926.405(b)

3-2.1 CABINETS, CUTOUT BOXES, & METER SOCKET ENCLOSURES: NFPA 70E-Part I, Ch.3-2.1
NEC 312.5 OSHA 1910.305(b)(1) OSHA 1926.405(b)(1)

OPENINGS TO BE CLOSED: NFPA 70E-Part I, Ch.3-2.1.1
METAL CABINETS, CUTOUT BOXES, & METER SOCKET ENCLOSURES: NFPA 70E-Part I, Ch. 3-2.1.2
CABLES: NFPA 70E-Part I, Ch.3-2.3

3-2.2 COVERS AND CANOPIES: NFPA 70E-Part I, Ch.3-2.2
NEC 312.10 OSHA 1910.305(b)(2) OSHA 1926.405(b)(2)

NONMETALLIC OR METAL COVERS AND PLATES: NFPA 70E-Part I, Ch.3-2.2.1
EXPOSED COMBUSTIBLE WALL OR CEILING FINISH: NFPA 70E-Part I, Ch.3-2.2.2
FLEXIBLE CORD PENDANTS: NFPA 70E-Part I, Ch.3-2.2.3

3-2.3 PULL & JUNCTION BOXES FOR SYSTEMS OVER 600 VOLTS, NOMINAL: NFPA 70E-Part I, Ch.3-2.3

NEC 110.31(C) NEC 314.72(E) NEC 230.200 OSHA 1910.305(b)(3)(i) ; (ii) OSHA 1926.405(b)(3)(i); (ii)

3-3 POSITION AND CONNECTION OF SWITCHES: NFPA 70E-Part I, Ch.3-3
NEC 404.6 OSHA 1910.305(c) OSHA 1926.405(c)
3-3.1 SINGLE-THROW KNIFE SWITCHES: NFPA 70E-Part I, Ch.3-3.1
3-3.2 DOUBLE-THROW KNIFE SWITCHES: NFPA 70E-Part I, Ch.3-3.2
3-3.3 CONNECTION OF SWITCHES: NFPA 70E-Part I, Ch.3-3.3

3-3.4 PROVISIONS FOR SNAP SWITCH FACEPLATES: NFPA 70E-Part I, Ch.3-3.4
NEC 404.12 NEC 404.9 OSHA 1910.305(c)(2)

POSITION: NFPA 70E-Part I, Ch.3-3.4.1
GROUNDING: NFPA 70E-Part I, Ch.3-3.4.2

3-4 SWITCHBOARDS AND PANELBOARDS: NFPA 70E-Part I, Ch.3-4
NEC 384, Part I & II OSHA 1910.305 (d) OSHA 1926.405(d)

3-5 ENCLOSURES FOR DAMP OR WET LOCATIONS: NFPA 70E-Part I, Ch.3-5
NEC 300.6(C) NEC 314.15 NEC 312.2 OSHA 1910.305(e)(1)&(2) OSHA 1926.405(e)(1)&(2)

3-6 CONDUCTOR IDENTIFICATION: NFPA 70E-Part I, Ch.3-6
NEC 310.12 NEC 210.4(D) OSHA 1910.305(f) OSHA 1926.405(f)

3-6.1 GROUNDED CONDUCTORS: NFPA 70E-Part I, Ch.3-6.1

3-6.2 EQUIPMENT GROUNDING CONDUCTORS: NFPA 70E-Part I, Ch.3-6.2

3-6.3 UNGROUNDED CONDUCTORS: NFPA 70E-Part I, Ch.3-6.3

3-7 FLEXIBLE CORDS AND CABLES, 600 VOLTS, NOMINAL, OR LESS: NFPA 70E-Part I, Ch.3-7
NEC 400.1 OSHA 1910.305(g) OSHA 1926.405(g)

3-7.1 SUITABILITY: NFPA 70E-Part I, Ch.3-7.1

3-7.2 USES PERMITTED: NFPA 70E-Part I, Ch.3-7.2
NEC 400.7 OSHA 1910.305(g)(1)(i) OSHA 1926.405(g)(1)(i)

3-7.3 USES NOT PERMITTED: NFPA 70E-Part I, Ch.3-7.3
NEC 400.8 OSHA 1910.305(g)(1)(iii) OSHA 1926.405(g)(1)(iii)

3-7.4 IN SHOW WINDOWS AND SHOW CASES: NFPA 70E-Part I, Ch.3-7.4
NEC 400.11 OSHA 1910.305(g)(1)(iv)

3-7.5 MARKINGS, SPLICES, AND PULL AT JOINTS & TERMINALS: NFPA 70E-Part I, Ch.3-7.5
STANDARD MARKINGS: NFPA 70E-Part I, Ch.3-7.5.1
SPLICES: NFPA 70E-Part I, Ch.3-7.5.2
PULL AT JOINTS AND TERMINALS: NFPA 70E-Part I, Ch.3-7.5.3

3-8 PORTABLE CABLES OVER 600 VOLTS, NOMINAL: NFPA 70E-Part I, Ch.3-8
NEC 400.30 and Part III OSHA 1910.305(h) OSHA 1926.405(h)

3-8.1 CONSTRUCTION: NFPA 70E-Part I, Ch.3-8.1
CONDUCTORS: NFPA 70E-Part I, Ch.3-8.1.1
SHIELDS: NFPA 70E-Part I, Ch.3-8.1.2
EQUIPMENT GROUNDING CONDUCTOR(S): NFPA 70E-Part I, Ch.3-8.1.3

3-8.2 SHIELDING: NFPA 70E-Part I, Ch.3-8.2

3-8.3 GROUNDING: NFPA 70E-Part I, Ch.3-8.3

3-8.4 MINIMUM BENDING RADII: NFPA 70E-Part I, Ch.3-8.4

3-8.5 FITTINGS: NFPA 70E-Part I, Ch.3-8.5

3-8.6 SPLICES AND TERMINATIONS: NFPA 70E-Part I, Ch.3-8.6

3-9 FIXTURE WIRES: NFPA 70E-Part I, Ch.3-9
NEC Art. 402.3 OSHA 1910.305(i) OSHA 1926.405(i)

3-9.1 GENERAL: NFPA 70E-Part I, Ch.3-9.1
NEC Art. 402.3 NEC 402.8 OSHA 1910.305(i)(1) OSHA 1926.405(i)(1)

3-9.2 USES PERMITTED: NFPA 70E-Part I, Ch.3-9.2
NEC Art. 402.10 OSHA 1910.305(i)(2) OSHA 1926.405(i)(2)

3-9.3 USES NOT PERMITTED: NFPA 70E-Part I, Ch.3-9.3
NEC Art. 402.11 OSHA 1910.305(i)(3) OSHA 1926.405(i)(3)

3-10 EQUIPMENT FOR GENERAL USE: NFPA 70E-Part I, Ch.3-10
NEC 410.4 OSHA 1910.305(j) OSHA 1926.405(j)

3-10.1 LIVE PARTS: NFPA 70E-Part I, Ch.3-10.1
NEC 410.3, Ex. OSHA 1910.305(j)(1)(i) OSHA 1926.405(j)(1)(i)
(a) PORTABLE HANDLAMPS
NEC 410.42(B) OSHA 1910.305(j)(1)(ii) OSHA 1926.405(j)(1)(ii)
(b) LAMPHOLDERS
NEC 410 VIII & IX & X OSHA 1910.305(j)(1)(iii) OSHA 1926.405(j)(1)(iii)
(c) WET AND DAMP LOCATIONS
NEC 410.4(A) OSHA 1910.305(j)(1)(iv) OSHA 1926.405(j)(1)(iv)

3-10.2 RECEPTACLES, CORD CONNECTORS, & ATTACHMENT PLUGS (CAPS): NFPA 70E-Part I, Ch.3-10.2
NEC 406.6 & 7 & 8 OSHA 1910.305(j)(2)(i) & (ii) OSHA 1926.405(j)(2)(i) & (ii)

ATTACHMENT PLUGS: NFPA 70E-Part I, Ch.3-10.2.1
NONINTERCHANGEABILITY: NFPA 70E-Part I, Ch.3-10.2.2
RECEPTACLES IN DAMP OR WET LOCATIONS: NFPA 70E-Part I, Ch.3-10.2.3
DAMP LOCATIONS: NFPA 70E-Part I, Ch.3-10.2.3.1
WET LOCATIONS: NFPA 70E-Part I, Ch.3-10.2.3.2

3-10.3 APPLIANCES: NFPA 70E-Part I, Ch.3-10.3
NEC 422.1 OSHA 1910.305(j)(3)(i); (ii); (ii) OSHA 1926.405(j)(2)(i); (ii); (iii)
LIVE PARTS: NEC 422.4 NFPA 70E-Part I, Ch.3-10.3.1
DISCONNECTING MEANS: NEC 422.30 NFPA 70E-Part I, Ch.3-10.3.2
NAMEPLATE: NEC 422.60 NFPA 70E-Part I, Ch.3-10.3.3
NAMEPLATE MARKING: NFPA 70E-Part I, Ch.3-10.3.3.1
TO BE VISIBLE: NFPA 70E-Part I, Ch.3-10.3.3.2

3-10.4 MOTORS: NFPA 70E-Part I, Ch.3-10.4
NEC Art. 100 NEC 430 OSHA 1910.305(j)(4)(i) OSHA 1926.405(j)(4)(i)
WITHIN SIGHT: NFPA 70E-Part I, Ch.3-10.4.1
DISCONNECTING MEANS: NFPA 70E-Part I, Ch.3-10.4.2
LOCATION: NFPA 70E-Part I, Ch.3-10.4.2.1
CONTROLLER: NFPA 70E-Part I, Ch.3-10.4.2.1.1
MOTOR: NFPA 70E-Part I, Ch.3-10.4.2.1.2
TO BE INDICATING: NFPA 70E-Part I, Ch.3-10.4.3
READILY ACCESSIBLE: NFPA 70E-Part I, Ch.3-10.4.4
MOTOR SERVED BY SINGLE DISCONNECTING MEANS: NFPA 70E-Part I, Ch.3-10.4.5
MOTOR/BRANCH-CIRCUIT OVERLOAD PROTECTION: NFPA 70E-Part I, Ch.3-10.4.6
GUARDING OF LIVE PARTS: NFPA 70E-Part I, Ch.3-10.4.7
AGAINST ACCIDENTAL CONTACT: NFPA 70E-Part I, Ch.3-10.4.7.1
PREVENT PHYSICAL DAMAGE: NFPA 70E-Part I, Ch.3-10.4.7.2
WARNINGS SIGNS: NFPA 70E-Part I, Ch.3-10.4.7.3
GUARDS FOR ATTENDANTS: NFPA 70E-Part I, Ch.3-10.4.8

3-10.5 TRANSFORMERS: NFPA 70E-Part I, Ch.3-10.5
NEC Art. 450 OSHA 1910.305(j)(5) OSHA 1926.405(j)(5)

TRANSFORMERS NOT COVERED: NFPA 70E-Part I, Ch.3-10.5.1
NEC. 450.1, Ex 1 to 8 OSHA 1910.305(j)(5)(i)(A)-(E) OSHA 1926.405(j)(5)(i)(A)-(D)
VOLTAGE WARNING: NFPA 70E-Part I, Ch.3-10.5.2
NEC. 450.8(D) OSHA 1910.305(j)(5)(ii) OSHA 1926.405(j)(5)(ii)
DRY-TYPE TRANSFORMERS (INDOORS): NFPA 70E-Part I, Ch.3-10.5.3
NEC Art. 450.21 OSHA 1910.305(j)(5)(iii) OSHA 1926.405(j)(5)(iii)
OIL-INSULATED TRANSFORMERS INSTALLED INDOORS: NFPA 70E-Part I, Ch.3-10.5.4
OIL-INSULATED TRANSFORMERS INSTALLED OUTDOORS: NFPA 70E-Part I, Ch.3-10.5.5
DOORWAYS: NFPA 70E-Part I, Ch.3-10.5.6
NEC. 450.43(C) OSHA 1910.305(j)(5)(vi); (vii); (viii) OSHA 1926.405(j)(5)(vi); (vii); (viii)
(a) TYPE OF DOOR (b) SILLS (c) LOCKS
WATER PIPES AND ACCESSORIES: NEC 450.47 NFPA 70E-Part I, Ch.3-10.5.7
STORAGE IN VAULTS: NEC 450.48 NFPA 70E-Part I, Ch.3-10.5.8

3-10.6 CAPACITORS: NFPA 70E-Part I, Ch.3-10.6
NEC 460.1 OSHA 1910.305(j)(6) OSHA 1926.405(j)(6)

SWITCHING: NFPA 70E-Part I, Ch.3-10.6.1
NEC 460.24 OSHA 1910.305(j)(6)(i); (ii) (A); (B) OSHA 1926.405(j)(6)(i); (ii) (A); (B)

LOAD CURRENT: NFPA 70E-Part I, Ch.3-10.6.1.1
ISOLATION: NFPA 70E-Part I, Ch.3-10.6.1.2
ADDITIONAL REQUIREMENTS FOR SERIES CAPACITORS: NFPA 70E-Part I, Ch.3-10.6.1.3

3-10.7 STORAGE BATTERIES: NFPA 70E-Part I, Ch.3-10.7
NEC 480.8(A) OSHA 1910.305(j)(7)

CHAPTER 4 SPECIFIC PURPOSE EQUIPMENT AND INSTALLATIONS

4-1 ELECTRIC SIGNS AND OUTSIDE LIGHTING: NFPA 70E-Part I, Ch.4-1
NEC 600.1, Art. 100 OSHA 1910.306(a)

4-1.1 DISCONNECTS: NFPA 70E-Part I, Ch.4-1.1
NEC 600.6 OSHA 1910.306(a)(1)

4-2.2 LOCATION: NFPA 70E-Part I, Ch.4-1.2
NEC 600.6(C) OSHA 1910.306(a)(2)

4-2 CRANES AND HOISTS: NFPA 70E-Part I, Ch.4-2
NEC 610.11 OSHA 1910.306(b) OSHA 1926.406(a)

4-2.1 DISCONNECTING MEANS: NFPA 70E-Part I, Ch.4-2.1
NEC 610.31 NEC 610.32 OSHA 1910.306(b)(1)(i); (ii) OSHA 1926.406(a)(1)(i); (ii)

RUNWAY CONDUCTOR DISCONNECTING MEANS: NFPA 70E-Part I, Ch.4-2.1.1
DISCONNECTING MEANS FOR CRANES/ MONORAIL HOISTS: NFPA 70E-Part I, Ch.4-2.1.2

4-2.2 LIMIT SWITCH: NFPA 70E-Part I, Ch.4-2.2

4-2.3 CLEARANCE: NFPA 70E-Part I, Ch.4-2.3
NEC 610.55 NEC 610.57 OSHA 1910.306(b)(2); (3) OSHA 1926.406(a)(2); (3)

4-3 ELEVATORS, DUMBWAITERS, ESCALATORS, MOVING WALKS, WHEELCHAIR LIFTS, AND STAIRWAY CHAIR LIFTS: NFPA 70E-Part I, Ch.4-3
NEC 620.1 OSHA 1910.306(c) OSHA 1926.406(b)

4-3.1 DISCONNECTING MEANS: NFPA 70E-Part I, Ch.4-3.1
NEC 620.51 OSHA 1910.306(c)(1); (2); (3) OSHA 1926.406(b)(1); (2); (3)

TYPE: NFPA 70E-Part I, Ch.4-3.1.1
OPERATION: NFPA 70E-Part I, Ch.4-3.1.2
LOCATION: NFPA 70E-Part I, Ch.4-3.1.3
(C)(1) ON ELEVATORS WITHOUT GENERATOR FIELD CONTROL
(C)(2) ON ELEVATORS WITH GENERATOR FIELD CONTROL
(C)(3) ON ESCALATORS AND MOVING WALKS
(C)(4) ON WHEELCHAIR LIFTS AND STAIRWAY CHAIR LIFTS
IDENTIFICATION AND SIGNS: NEC 620.51(D) NFPA 70E-Part I, Ch.4-3.1.3

4-3.2 SINGLE-CAR AND MULTICAR INSTALLATIONS: NEC 620.52(A) NFPA 70E-Part I, Ch.4-3.2

4-3.3 WARNING SIGN FOR MULTIPLE DISCONNECTING MEANS: NEC 620.52(B) NFPA 70E-Part I, Ch.4-3.3

4-3.4 INTERCONNECTION MULTICAR CONTROLLERS: NEC 620.52(C) NFPA 70E-Part I, Ch.4-3.4

4-3.5 MOTOR CONTROLLERS: NFPA 70E-Part I, Ch.4-3.5

4-4 ELECTRIC WELDERS - DISCONNECTING MEANS: NFPA 70E-Part I, Ch.4-4
NEC 630.1 OSHA 1910.306(d) OSHA 1926.406(c)

4-4.1 ARC WELDERS: NFPA 70E-Part I, Ch.4-4.1
NEC 630.11 OSHA 1910.306(d)(1) OSHA 1926.406(c)(1) OSHA 1926.351 & 352

4-4.2 RESISTANCE WELDER: NFPA 70E-Part I, Ch.4-4.2
NEC 630.31 OSHA 1910.306(d)(2) OSHA 1926.406(c)(2)

4-5 INFORMATION TECHNOLOGY EQUIPMENT - DISCONNECTING MEANS: NFPA 70E-Part I, Ch.4-5
NEC 645.10 OSHA 1910.306(e)

4-6 X-RAY EQUIPMENT:
NEC 660.1 OSHA 1910.306(f) OSHA 1926.406(d)

4-6.1 DISCONNECTING MEANS: NFPA 70E-Part I, Ch.4-6.1
NEC 660.5 NEC 660.24 OSHA 1910.306(f)(1)(i); (ii) OSHA 1926.406(d)(1)(i); (ii)

DISCONNECTING MEANS: NFPA 70E-Part I, Ch.4-6.1.1
INDEPENDENT CONTROL: NFPA 70E-Part I, Ch.4-6.1.2

4-6.2 CONTROL - INDUSTRIAL & COMMERCIAL LAB EQUIPMENT: NFPA 70E-Part I, Ch.4-6.2
RADIOGRAPHIC & FLUOROSCOPIC TYPES: NFPA 70E-Part I, Ch.4-6.2.1
DIFFRACTION & IRRADIATION TYPES: NFPA 70E-Part I, Ch.4-6.2.2

4-7 INDUCTION AND DIELECTRIC HEATING: NFPA 70E-Part I, Ch.4-7
NEC 665.1 OSHA 1910.306(g)

4-7.1 SCOPE: NFPA 70E-Part I, Ch.4-7.1
NEC 665.1 OSHA 1910.306(g)(1)

4-7.2 GUARDING, GROUNDING, AND LABELING: NFPA 70E-Part I, Ch.4-7.2
NEC 665.20 OSHA 1910.306(g)(2)(i); (ii)

ENCLOSURES: NEC 665.20 — NFPA 70E-Part I, Ch.4-7.2 .1
PANEL CONTROL: NEC 665.21 — NFPA 70E-Part I, Ch.4-7.2 .2
OSHA 1910.306(g)(2)(i); (ii)
ACCESS TO INTERNAL EQUIPMENT: NEC 665.22 — NFPA 70E-Part I, Ch.4-7.2.3
OSHA 1910.306(g)(2)(iii)
WARNING LABELS OR SIGNS: NEC 665.23 — NFPA 70E-Part I, Ch.4-7.2.4
OSHA 1910.306(g)(2)(iv)
WORK APPLICATOR SHIELDING: NEC 665.25 — NFPA 70E-Part I, Ch.4-7.2.5
DISCONNECTING MEANS: NEC 665.22 — NFPA 70E-Part I, Ch.4-7.2.6
OSHA 1910.306(g)(2)(v); (vi)

4-7.3 REMOTE CONTROL: — NFPA 70E-Part I, Ch.4-7.3
OSHA 1910.306(g)(3)

SELECTOR SWITCH: — NFPA 70E-Part I, Ch.4-7.3.1
FOOT SWITCHES: — NFPA 70E-Part I, Ch.4-7.3.2

4-8 ELECTROLYTIC CELLS: — NFPA 70E-Part I, Ch.4-8
NEC 668.1 OSHA 1910.306(h)

4-8.1 SCOPE: — NFPA 70E-Part I, Ch.4-8.1
NEC 668.1 OSHA 1910.306(h)(1)

4-8.2 DEFINITIONS APPLICABLE TO SECTION 4-8: — NFPA 70E-Part I, Ch.4-8.2
NEC 668.2 OSHA 1910.306(h)(2)

CELL, ELECTROLYTIC: — NFPA 70E-Part I, Ch.4-8.2.1
CELL LINE: — NFPA 70E-Part I, Ch.4-8.2.2
CELL LINE ATTACHMENTS &/AUXILIARY EQUIPMENT: — NFPA 70E-Part I, Ch.4-8.2.3
ELECTROLYTIC CELL LINE WORKING ZONE: — NFPA 70E-Part I, Ch.4-8.2.4
NEC 668.10 OSHA 1910.306(h)(2)

4-8.3 APPLICATION: — NFPA 70E-Part I, Ch.4-8.3
NEC 668.3(C) OSHA 1910.306(h)(3)(i); (ii); (iii)

4-8.4 DISCONNECTING MEANS: — NFPA 70E-Part I, Ch.4-8.4
NEC 668.13 OSHA 1910.306(h)(4)(i); (ii)

MORE THAN ONE PROCESS POWER SUPPLY: — NFPA 70E-Part I, Ch.4-8.4.1
REMOVABLE LINKS OR CONDUCTORS: — NFPA 70E-Part I, Ch.4-8.4.2

4-8.5 PORTABLE ELECTRICAL EQUIPMENT: — NFPA 70E-Part I, Ch.4-8.5
NEC 668.20 OSHA 1910.306(h)(5)(i); (ii)

PORTABLE EQUIPMENT NOT TO BE GROUNDED: — NFPA 70E-Part I, Ch.4-8.5.1
MARKING: — NFPA 70E-Part I, Ch.4-8.5.2

4-8.6 POWER SUPPLY CIRCUITS & RECEPTACLES FOR PORTABLE ELECTRIC EQUIPMENT: — NFPA 70E-Part I, Ch.4-8.6
NEC 668.21 OSHA 1910.306(h)(6)(i); (ii); (iii)

ISOLATED CIRCUITS: — NFPA 70E-Part I, Ch.4-8.6.1
NONINTERCHANGEABILITY: — NFPA 70E-Part I, Ch.4-8.6.2
MARKING: — NFPA 70E-Part I, Ch.4-8.6.3

4-8.7 FIXED AND PORTABLE EQUIPMENT: NFPA 70E-Part I, Ch.4-8.7
NEC 668.30(A) thru (E) OSHA 1910.306(h)(7)(i); (ii)

EQUIPMENT NOT REQUIRED TO BE GROUNDED: NFPA 70E-Part I, Ch.4-8.7.1
EXPOSED CONDUCTIVE SURFACES NOT REQUIRED TO BE GROUNDED: NFPA 70E-Part I, Ch.4-8.7.2
WIRING METHODS: NFPA 70E-Part I, Ch.4-8.7.3
CIRCUIT PROTECTION: NFPA 70E-Part I, Ch.4-8.7.4
BONDING: NEC 668.30(E) NFPA 70E-Part I, Ch.4-8.7.5
OSHA 1910.306(h)(7)(iv)
AUXILIARY NONELECTRIC CONNECTIONS: NEC 668.31 NFPA 70E-Part I, Ch.4-8.7.6
OSHA 1910.306(h)(8)

4-8.8 CRANES AND HOISTS: NFPA 70E-Part I, Ch.4-8.8
NEC 668.32 OSHA 1910.306(f)(9)(i); (ii)

CONDUCTIVE SURFACES TO BE INSULATED FROM GROUND: NFPA 70E-Part I, Ch.4-8.8.1
HAZARDOUS ELECTRICAL CONDITIONS: NFPA 70E-Part I, Ch.4-8.8.2

4-9 ELECTRICALLY DRIVEN OR CONTROLLED IRRIGATION MACHINES: NFPA 70E-Part I, Ch.4-9
NEC 675.15 NEC 675.8 OSHA 1910.306(l)(1); (2)

4-9.1 LIGHTNING PROTECTION: NFPA 70E-Part I, Ch.4-9.1
4-9.2 MAIN DISCONNECTING MEANS: NFPA 70E-Part I, Ch.4-9.2

4-10 SWIMMING POOLS, FOUNTAINS, AND SIMILAR INSTALLATIONS: NFPA 70E-Part I, Ch.4-10
NEC 680.1 OSHA 1910.306(j)

4-10.1 SCOPE: NFPA 70E-Part I, Ch.4-10.1
NEC 680.1 OSHA 1910.306(j)(1)

4-10.2 RECEPTACLES: NFPA 70E-Part I, Ch.4-10.2
NEC 680.22 OSHA 1910.306(j)(2)(i)

4-10.3 LIGHTING FIXTURES, LIGHTING OUTLETS, & CEILING SUSPENDED (PADDLE) FANS: NFPA 70E-Part I, Ch.4-10.3
NEC 680.22(B OSHA 1910.306(j)(2)(ii)

4-10.4 UNDERWATER EQUIPMENT: NFPA 70E-Part I, Ch.4-10.4
NEC 680.20 OSHA 1910.306(j)(4)(i); (ii)

4-10-5 FOUNTAINS: NFPA 70E-Part I, Ch.4-10.5
NEC 680.51(A) OSHA 1910.306(j)(5)
GROUND-FAULT CIRCUIT INTERRUPTER: NEC 680.5 NFPA 70E-Part I, Ch.4-10.5.1

4-10.6 SPAS AND HOT TUBS: NEC 680.40 NFPA 70E-Part I, Ch.4-10.6
GROUND-FAULT CIRCUIT INTERRUPTER: NEC 680.5 NFPA 70E-Part I, Ch.4-10.6.1

4-11 CARNIVALS, CIRCUSES, FAIRS, AND SIMILAR EVENTS: NFPA 70E-Part I, Ch.4-11
NEC 525.1 thru 40

4-11.1 GENERAL REQUIREMENTS: NFPA 70E-Part I, Ch.4-11.1
SCOPE: NFPA 70E-Part I, Ch.4-11.1.1
PORTABLE WIRING AND EQUIPMENT: NFPA 70E-Part I, Ch.4-11.1.2
PROTECTION OF ELECTRICAL EQUIPMENT: NFPA 70E-Part I, Ch.4-11.1.3

4-11.2 INSTALLATION:	NFPA 70E-Part I, Ch.4-11.2
SERVICES:	NFPA 70E-Part I, Ch.4-11.2.1
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4-11.4 DISCONNECTING MEANS:	NFPA 70E-Part I, Ch.4-11.4
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CHAPTER 5 HAZARDOUS (CLASSIFIED) LOCATIONS, CLASS I, II, & III, DIVISIONS 1, 2 & CLASS I, ZONES 0, 1, & 2

5-1 SCOPE: NFPA 70E-Part I, Ch.5-1

NEC 500.1 OSHA 1910.307(a) OSHA 1926.407(a)

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5-2 GENERAL: NFPA 70E-Part I, Ch.5-2
NEC 500.4; 5; 6 ; 7 OSHA 1910.307(b)(2) OSHA 1926.407(b)(2)

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5-3 ELECTRICAL INSTALLATIONS: NFPA 70E-Part I, Ch.5-3
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5-4 CLASS I, ZONE 0, 1, AND 2 LOCATIONS: NFPA 70E-Part I, Ch.5-4
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5-4.1 SCOPE: NFPA 70E-Part I, Ch.5-4.1
5-4.2 OTHER ARTICLES: NFPA 70E-Part I, Ch.5-4.2
5-4.3 LOCATION AND GENERAL REQUIREMENTS: NFPA 70E-Part I, Ch.5-4.3
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5-4.4 PROTECTION TECHNIQUES: NFPA 70E-Part I, Ch.5-4.4
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(c) INTRINSIC SAFETY
(d) TYPE OF PROTECTION "n"
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(f) INCREASED SAFETY "e"
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5-4.5 REFERENCE STANDARDS: NFPA 70E-Part I, Ch.5-4.5

5-4.6 SPECIAL PRECAUTION: NFPA 70E-Part I, Ch.5-4.6

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5-4.7 GROUPING AND CLASSIFICATION: NFPA 70E-Part I, Ch.5-4.7
(a) GROUP IIC
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5-4.8 CLASS I TEMPERATURE: NFPA 70E-Part I, Ch.5-4.8

5-4.9 ZONE CLASSIFICATION: NFPA 70E-Part I, Ch.5-4.9

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5-4.10 LISTING, MARKING AND DOCUMENTATION: NFPA 70E-Part I, Ch.5-4.10

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1. DIVISION EQUIPMENT
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3. TEMPERATURE CLASSIFICATIONS

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5-4.12 EQUIPMENT: NFPA 70E-Part I, Ch.5-4.12
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5-4.13 INCREASED SAFETY "e" MOTORS/GENERATORS: NEC 505.22 NFPA 70E-Part I, Ch.5-4.13

5-4.14 GROUNDING AND BONDING: NEC 505.25 NFPA 70E-Part I, Ch.5-4.14

CHAPTER 6 SPECIAL SYSTEMS

6-1 <u>SYSTEMS OVER 600 VOLTS, NOMINAL</u>: NFPA 70E-Part I, Ch. 6-1
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6-1.1 ABOVEGROUND WIRING METHODS: NFPA 70E-Part I, Ch. 6-1.1

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6-1.3 INSULATION SHIELDING: NFPA 70E-Part I, Ch. 6-1.3

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6-1.7 MOBILE AND PORTABLE EQUIPMENT: NFPA 70E-Part I, Ch. 6-1.5.7
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6-2.1 SCOPE: NFPA 70E-Part I, Ch. 6-2.1
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6-2.2 WIRING: NFPA 70E-Part I, Ch. 6-2.2
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6-2.3 EMERGENCY ILLUMINATION: NFPA 70E-Part I, Ch. 6-2.3
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6-2.4 SIGNS: NEC 700.8 NFPA 70E-Part I, Ch. 6-
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6-3 CLASS 1, CLASS 2, & CLASS 3 REMOTE CONTROL, SIGNALING, & POWER-LIMITED CIRCUITS: NFPA 70E-Part I, Ch. 6-3
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6-3.1 CLASSIFICATION: NFPA 70E-Part I, Ch. 6-3.1
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6-4 FIRE ALARM SYSTEMS: NFPA 70E-Part I, Ch. 6-4
NEC 760.1 OSHA 1910.308(d)

6-4.1 CLASSIFICATION: NFPA 70E-Part I, Ch. 6-4.1
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6-4.2 POWER SOURCES: NFPA 70E-Part I, Ch. 6-4.2
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(a) NONPOWER-LIMITED FIRE ALARM (NPLFA) CIRCUIT POWER SOURCE REQUIREMENTS: NFPA 70E-Part I, Ch. 6-4.2(a)
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(b) POWER SOURCES FOR POWER-LIMITED FIRE ALARM (PLFA) CIRCUITS: NFPA 70E-Part I, Ch. 6-4.2(b)
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6-4.3 CONDUCTORS OF DIFFERENT CIRCUITS IN SAME CABLE, ENCLOSURE, OR RACEWAY: NFPA 70E-Part I, Ch. 6-4.3

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6-4.4 INSTALLATION OF CONDUCTORS AND EQUIPMENT: NFPA 70E-Part I, Ch. 6-4.4

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6-5 COMMUNICATIONS SYSTEMS: NFPA 70E-Part I, Ch. 6-5
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6-5.1 SCOPE: NFPA 70E-Part I, Ch. 6-5.1
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6-5.2 PROTECTIVE DEVICES: NFPA 70E-Part I, Ch. 6-5.2
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6-5.3 CONDUCTOR LOCATION: NFPA 70E-Part I, Ch. 6-5.3
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6-5.4 GROUNDING: NFPA 70E-Part I, Ch. 6-5.4
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6-6 SOLAR PHOTOVOLTAIC SYSTEMS: NFPA 70E-Part I, Ch. 6-6
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6-6.1 GENERAL: NFPA 70E-Part I, Ch. 6-6.1
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6-6.2 CONDUCTORS OF DIFFERENT SYSTEMS: NFPA 70E-Part I, Ch. 6-6.2
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6-6.3 DISCONNECTING MEANS: NFPA 70E-Part I, Ch. 6-6.3
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6-7 INTEGRATED ELECTRICAL SYSTEMS: NFPA 70E-Part I, Ch. 6-7
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6-7.1 SCOPE: NFPA 70E-Part I, Ch. 6-7.1
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6-7.2 LOCATION OF OVERCURRENT DEVICES IN OR ON PREMISES: NFPA 70E-Part I, Ch. 6-7.2
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PART II SAFETY-RELATED WORK PRACTICES

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1-2 PURPOSE: NFPA 70E-Part II, Ch. 1-2

1-3 RESPONSIBILITY: NFPA 70E-Part II, Ch. 1-3

1-4 ORGANIZATION: NFPA 70E-Part II, Ch. 1-4

1-5 TRAINING REQUIREMENTS: NFPA 70E-Part II, Ch. 1-5

1-5.1 SAFETY TRAINING: NFPA 70E-Part II, Ch. 1-5.1
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1-5.2 TYPE OF TRAINING: NFPA 70E-Part II, Ch. 1-5.2
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1-5.3 EMERGENCY PROCEDURES: NFPA 70E-Part II, Ch. 1-5.3
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2-1.1 GENERAL: NFPA 70E-Part II, Ch. 2-1.1
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2-1.2 WORKING ON OR NEAR DE-ENERGIZED ELECTRICAL CONDUCTORS OR CIRCUITS PARTS THAT HAVE LOCKOUT/TAGOUT DEVICES APPLIED: NFPA 70E-Part II, Ch. 2-1.2

2-1.3 WORKING ON OR NEAR EXPOSED CONDUCTORS OR CIRCUIT PARTS THAT ARE OR MIGHT BECOME ENERGIZED: NFPA 70E-Part II, Ch. 2-1.3

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2-2.3 EMPLOYER AND EMPLOYEE RESPONSIBILITY: NFPA 70E-Part II, Ch. 2-2.3

2-2.4 APPROACH DISTANCES FOR UNQUALIFIED PERSONS: NFPA 70E-Part II, Ch. 2-2.4

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FINAL RULE 1910.333(c)(2) FINAL RULE 1910.335(a)

11-2 INSPECTION AND TESTING OF PROTECTIVE EQUIPMENT & PROTECTIVE TOOLS: NFPA 70E-Part III, Ch.11-2

VISUAL: NFPA 70E-Part III, Ch.11-2.1
TESTING: NFPA 70E-Part III, Ch.11-2.2

11-3 SAFETY GROUNDING EQUIPMENT: NFPA 70E-Part III, Ch.11-3

VISUAL: NFPA 70E-Part III, Ch.11-3.1
TESTING: NFPA 70E-Part III, Ch.11-3.2

PART IV SAFETY REQUIREMENTS FOR SPECIAL EQUIPMENT: NFPA 70E- Part IV, Ch.1

CHAPTER 1 INTRODUCTION: NFPA 70E-Part IV, Ch.1

1-1 SCOPE: NFPA 70E-Part IV, Ch.1-1

1-2 RESPONSIBILITY: NFPA 70E-Part IV, Ch.1-2

1-3 ORGANIZATION: NFPA 70E-Part IV, Ch.1-3

CHAPTER 2 SAFETY-RELATED WORK PRACTICES FOR ELECTROLYTIC CELLS: NFPA 70E- Part IV, Ch.2

2-1 SCOPE: NFPA 70E-Part IV, Ch.2-1

NEC 668.1 1910.306 (h)(1)

2-2 DEFINITIONS: NFPA 70E-Part IV, Ch.2-2

NEC 668.2 1910.306(h)(2)

BATTERY EFFECT: NFPA 70E-Part IV, Ch.2-2.1
SAFEGUARDING: NFPA 70E-Part IV, Ch.2-2.2

2-3 SAFETY TRAINING: NFPA 70E-Part IV, Ch.2-3

GENERAL: NFPA 70E-Part IV, Ch.2-3.1
TRAINING REQUIREMENTS: NFPA 70E-Part IV, Ch.2-3.2

2-4 EMPLOYEE TRAINING: NFPA 70E-Part IV, Ch.2-4

QUALIFIED PERSONS: NFPA 70E-Part IV, Ch.2-4.1
UNQUALIFIED PERSONS: NFPA 70E-Part IV, Ch.2-4.2

2-5 SAFEGUARDING OF EMPLOYEES IN A CELL LINE WORKING ZONE: NFPA 70E-Part IV, Ch.2-5

GENERAL: NFPA 70E-Part IV, Ch.2-5.1
SIGNS: NFPA 70E-Part IV, Ch.2-5.2
ELECTRICAL FLASH HAZARD ANALYSIS: NFPA 70E-Part IV, Ch.2-5.3
FLASH HAZARD ANALYSIS PROCEDURE: NFPA 70E-Part IV, Ch.2-5.3.1
ROUTINE TASKS: NFPA 70E-Part IV, Ch.2-5.3.2
NON-ROUTINE TASKS: NFPA 70E-Part IV, Ch.2-5.3.3
SAFEGUARDS: NFPA 70E-Part IV, Ch.2-5.4
INSULATION: NFPA 70E-Part IV, Ch.2-5.4.1
PERSONAL PROTECTIVE EQUIPMENT: NFPA 70E-Part IV, Ch.2-5.4.2
STANDARDS FOR PPE: NFPA 70E-Part IV, Ch.2-5.4.2.1
TESTING OF PPE: NFPA 70E-Part IV, Ch.2-5.4.2.2
BARRIERS: NFPA 70E-Part IV, Ch.2-5.4.2.3
VOLTAGE EQUALIZATION: NFPA 70E-Part IV, Ch.2-5.4.2.4
ISOLATION: NFPA 70E-Part IV, Ch.2-5.4.2.5
SAFE WORK PRACTICES: NFPA 70E-Part IV, Ch.2-5.4.2.6
TOOLS: NFPA 70E-Part IV, Ch.2-5.4.2.7
PORTABLE CUTOUT TYPE SWITCHES: NFPA 70E-Part IV, Ch.2-5.4.2.8
CRANES AND HOISTS: NFPA 70E-Part IV, Ch.2-5.4.2.9
NEC 668.32 1910.306(h)(9)
ATTACHMENTS: NFPA 70E-Part IV, Ch.2-5.4.2.10
PACEMAKERS AND METALLIC IMPLANTS: NFPA 70E-Part IV, Ch.2-5.4.2.11
TESTING: NFPA 70E-Part IV, Ch.2-5.4.2.12

2-6 PORTABLE TOOLS AND EQUIPMENT: NFPA 70E-Part IV, Ch.2-6

PORTABLE ELECTRICAL EQUIPMENT: NFPA 70E-Part IV, Ch.2-6.1
NEC 668.20 1910.306(h)(5)(i); (ii)

AUXILIARY NON-ELECTRIC CONNECTIONS: NFPA 70E-Part IV, Ch.2-6.2
NEC 668.31 1910.306(h)(8)

WELDING MACHINES: NFPA 70E-Part IV, Ch.2-6.3

PORTABLE TEST EQUIPMENT: NFPA 70E-Part IV, Ch.2-6.4

CHAPTER 2, APPENDIX A, TYPICAL APPLICATION OF SAFEGUARDS IN THE CELL LINE WORKING ZONE

A-10 APPLICATION OF SAFEGUARDS

A-11 ELECTRICAL POWER RECEPTACLES

CHAPTER 3 SAFETY REQUIREMENTS RELATED TO BATTERIES & BATTERY ROOMS: NFPA 70E-Part IV,
NEC 480.1 to 480.9 1910.178 (g) 1910.305(j)(7) 1926.441 (a) & (b)

3-1 SCOPE: NFPA 70E-Part IV, Ch.3-1

3-2 DEFINITIONS: NFPA 70E-Part IV, Ch.3-2

3-3 BATTERY CONNECTIONS: NFPA 70E-Part IV, Ch.3-3

METHODS OF CONNECTION: NFPA 70E-Part IV, Ch.3-3.1
BATTERY SHORT-CIRCUIT CURRENT: NFPA 70E-Part IV, Ch.3-3.2
CONNECTION BETWEEN BATTERY & DC SWITCHING EQUIPMENT: NFPA 70E-Part IV, Ch.3-3.3
GENERAL: NFPA 70E-Part IV, Ch.3-3.3.1
CABLE: NFPA 70E-Part IV, Ch.3-3.3.2
BUSBARS: NFPA 70E-Part IV, Ch.3-3.3.3
BUSWAYS: NFPA 70E-Part IV, Ch.3-3.3.4
DC SWITCHING EQUIPMENT: NFPA 70E-Part IV, Ch.3-3.4
TERMINALS AND CONNECTORS: NFPA 70E-Part IV, Ch.3-3.5
DC SYSTEMS GROUNDING AND GROUND-FAULT DETECTION: NFPA 70E-Part IV, Ch.3-3.6
PROTECTION OF DC CIRCUITS: NFPA 70E-Part IV, Ch.3-3.7
ALARMS: NFPA 70E-Part IV, Ch.3-3.8

3-4 INSTALLATIONS OF BATTERIES: NFPA 70E-Part IV, Ch.3-4

GENERAL: NFPA 70E-Part IV, Ch.3-4.1
ARRANGEMENT OF CELLS: NFPA 70E-Part IV, Ch.3-4.2
VENTILATION FOR BATTERIES OF THE VENTED TYPE: NFPA 70E-Part IV, Ch.3-4.3
VENTILATION FOR VRLA TYPE: NFPA 70E-Part IV, Ch.3-4.4
VENTILATION FOR SEALED GELLED ELECTRICAL TYPE: NFPA 70E-Part IV, Ch.3-4.5

3-5 BATTERY ROOM REQUIREMENTS: NFPA 70E-Part IV, Ch.3-5

GENERAL: NFPA 70E-Part IV, Ch.3-5.1
ROOM DESIGN REQUIREMENTS: NFPA 70E-Part IV, Ch.3-5.1.1
BATTERY ENCLOSURES: NFPA 70E-Part IV, Ch.3-5.1.2
BATTERY ROOM FLOOR LOADING: NFPA 70E-Part IV, Ch.3-5.1.3
BATTERY ROOM FLOOR CONSTRUCTION AND FINISH: NFPA 70E-Part IV, Ch.3-5.1.4
BATTERY LAYOUT AND FLOOR AREA: NFPA 70E-Part IV, Ch.3-5.2
TAKE-OFF BATTERY TERMINALS & OUTGOING BUSBARS & CABLES: NFPA 70E-Part IV, Ch.3-5.3
INTERCONNECTIONS BETWEEN ROWS: NFPA 70E-Part IV, Ch.3-5.4
BARRIERS: NFPA 70E-Part IV, Ch.3-5.5
ILLUMINATION: NFPA 70E-Part IV, Ch.3-5.6
LOCATION OF LUMINARIES & SWITCHES: NFPA 70E-Part IV, Ch.3-5.7
POWER: NFPA 70E-Part IV, Ch.3-5.8
LOCATION OF GENERAL-PURPOSE OUTLETS: NFPA 70E-Part IV, Ch.3-5.9

EXHIBIT 14.7 SAMPLE LOCKOUT/TAGOUT PROCEDURE

It is the Company's policy that lockout is the preferred method of controlling personnel exposure to electrical energy hazards. When the machine, equipment, or system cannot be locked out of service then a tagout procedure should be developed by the Foreman and reviewed and approved by both the Site Superintendent and Site Safety Coordinator.

To assist the Company's Site Superintendents, Foremen, and Site Safety Coordinator in developing a procedure that meets the requirement of applicable OSHA control of hazardous energy or lockout/tagout standards, the following sample procedure is provided for use in lockout or tagout programs.

This procedure can be used for an individual employee control, a simple lockout/tagout, or as part of a complex lockout/tagout. Where a job task is under the control of only one Company employee, the individual employee control procedure can be used in lieu of a lockout/tagout procedure. A more comprehensive plan will need to be developed, documented, and used for the complex lockout/tagout.

COMPANY'S SITE-SPECIFIC LOCKOUT/TAGOUT PROCEDURE

Procedure Developed By:_____ Date:__/__/__
Foreman

Reviewed & Approved By:_____ Date:__/__/__
Site Safety Coordinator

Reviewed & Approved By:_____ Date:__/__/__
Site Superintendent

1.0 PURPOSE

This procedure establishes the minimum requirements for the Company's site-specific lockout/tagout of electrical energy sources. It is to be used to ensure that conductors and circuit parts are disconnected from sources of electrical energy, locked and tagged, and tested before work begins, whenever employees could be exposed to dangerous conditions.

2.0 RESPONSIBILITY

The Foremen should ensure that Authorized Employees receive instructions on their lockout/tagout roles and responsibilities. Each Authorized Employee installing a lockout/tagout device should sign his or her name and the date on the tag and state how the Authorized Employee and/or his or her Foreman will be contacted.

3.0 LOCKOUT/TAGOUT TRAINING SESSIONS

As part of the Company's site safety orientation session, and safety toolbox training session company site employees should be instructed in the safety significance of the lockout/tagout procedure. All new or transferred employees and all other Affected Employees (Company, Subcontractors, other contractors, vendors, or facility), whose work operations are or might be in the area, should be instructed in the purpose and use of this procedure. Company lockout/tagout training sessions will address:

Company's site-specific lockout/tagout procedures
Duty of Foremen
Duty of Authorized Employees
Single line & diagrammatic electrical drawings
Authorized and unauthorized removal of locks/tags
Use of tags and warning signs
Authorized and Affected employees accounting methods
Enforcing execution of lockout/tagout procedures
Simple lockout/tagout
Complex lockout/tagout
Recognizing lockout/tagout devices
Installing lockout/tagout devices
Individual employee control of energy
Release of stored energy
Installing grounding devices
Retraining sessions

4.0 PREPARATION FOR LOCKOUT/TAGOUT

4.1 Description of Machine or Equipment

Location:_____
Type of Machine or Equipment:_____
Name of Manufacturer:_____Model #_____
Scope of Work:_____

4.2 Types and description of both external and internal sources of hazardous energy for the machine or equipment that will be serviced:

ENERGY SOURCES COMMENTS

Electrical:_____ ☐
Mechanical:_____ ☐
Pneumatic:_____ ☐
Chemical:_____ ☐
Fluids & Gases:_____ ☐
Electromagnetic:_____ ☐
Ultraviolet:_____ ☐
Thermal:_____ ☐
Hydraulic:_____ ☐
Gravity:_____ ☐
Radiation:_____

4.3 When required, apply for and receive a job task lockout/tagout work permit and post at the work location. Performed ☐ Yes ☐ No Comments:_____

4.4 Complete/document a job hazard analysis survey of the job task. Performed ☐ Yes ☐ No Comments:_____

4.5 Review current diagrammatic drawings (or other equally effective means), tags, labels, and signs to identify and locate all disconnecting means to determine that power is interrupted by a physical break and not de-energized by a circuit interlock. Make a list of disconnecting means to be locked and tagged out of service. Performed ☐ Yes ☐ No Comments:_____

4.6 Review disconnecting means to determine adequacy of their interrupting ability and if it will be possible to verify a visible open point or if other precautions will be needed. Performed ☐ Yes ☐ No Comments:_____

4.7 Review other work activity to identify where and how other site personnel might be exposed to sources of electrical energy hazards. Review other energy sources in the physical area to determine employee exposure to sources of other types of energy. Establish energy control methods for control of other hazardous energy sources in the area. Performed ☐ Yes ☐ No Comments:_____

4.8 Provide an adequately rated voltage detector to test each phase conductor or circuit part to verify that these are de-energized. Use manufacturer's guidelines for the detector to determine that the device is operating satisfactorily. Performed ☐ Yes ☐ No Comments:_____

4.9 Obtain material safety data sheets on each hazardous substance, review with Authorized Employees, and provide copies at work location. Performed ☐ Yes ☐ No Comments:_____

4.10 Obtain and issue appropriate personal protective equipment to Authorized Employees. Performed ☐ Yes ☐ No Comments:_____

4.11 Obtain and issue to Authorized Employees their individual locks and tags. Performed ☐ Yes ☐ No Comments:_____

4.12 Conduct pre-job safety and lockout/tagout planning meetings with Authorized Employees. Performed ☐ Yes ☐ No Comments:_____

4.13 Notify Affected Employees (Company, Subcontractor, other contractors, vendors, or facility) of the Company's lockout/tagout job task and the reasons for the machine or equipment shutdown. Performed ☐ Yes ☐ No Comments:_____

4.14 Assure Foreman is present when the job task hazardous energy sources is being de-energized, grounded, residual energy bled down, blocked, locked and tagged out of service. Performed ☐ Yes ☐ No Comments:_____

4.15 Verify that the machine or equipment is locked out by testing the operating controls. Return all controls to the "neutral" or "off" position after testing. Performed ☐ Yes ☐ No Comments:_____

4.16 When the machine or equipment has been de-energized, locked and tagged out of service by the facility operator, the Authorized Employees' locks and tags should be placed on top of the facility operator's locks & tags. The Authorized Employees' locks and tags are only to be removed when the Authorized Employees' job tasks are completed and prior to the Customer's locks and tags coming off. Performed ☐ Yes ☐ No Comments:_____

4.17 Where the possibility of induced voltages or stored electrical energy exists, the Authorized Employee must properly apply grounding devices on the phase conductors or circuit parts. Where it could be reasonably anticipated that contact with other exposed energized conductors or circuit parts is possible, the Authorized Employee should apply ground connecting devices. Performed ☐ Yes ☐ No Comments:_____

5.0 RESTORING THE EQUIPMENT AND/OR ELECTRICAL SUPPLY TO NORMAL CONDITION.

5.1 Check the machine or equipment to be sure it is operationally intact and tools have been removed. Performed ☐ Yes ☐ No Comments:_____

5.2 Check to be sure all Authorized and Affected Employees are safely positioned. Performed ☐ Yes ☐ No Comments:_____

5.3 Notify all Affected Employees that locks/tags are going to be removed and the machine or equipment is ready for operation. Performed ☐ Yes ☐ No Comments:_____

5.4 Remove all locks, tags, grounding devices, blocks, other energy restraints, reinstall safety guards, reset controls to correct settings and check safety relief vents. Performed ☐ Yes ☐ No Comments:_____

5.5 Notify the Customer and other necessary personnel that the equipment and/or electrical supply is ready to be returned to normal operation. Performed ☐ Yes ☐ No Comments:_____

5.6 Restore all energy to the machine or equipment. Performed ☐ Yes ☐ No Comments:_____

6.0 Other Comments:_____

EXHIBIT 14.8 SOURCES FOR OTHER REFERENCE MATERIALS

American Conference of Governmental Industrial Hygienists - www.acgih.org
American Industrial Hygiene Association - www.aiha.org
American National Standards Institute - www.ansi.org
American Red Cross - www.redcross.org
American Society of Safety Engineers - www.asse.org
American Society of Testing and Materials - www.astm.org
Best 's Safety & Security Directory - www.safety.ambest.com
Bureau of Labor Statistics - www.bls.gov
Center to Protect Workers' Rights - www.cpwr.org
CNA Electrical Contractors Class Program - www.cna.com/commercial/eccp
Cooper Bussmann - www.bussmann.com
Department of Transportation - www.dot.gov
Engineering News Record - www.enr.com
Environmental Protection Agency - www.epa.gov
Institute of Electrical and Electronics Engineers - www.ieee.org
International Association of Lighting Designers - www.iald.org
International Brotherhood of Electrical Workers - www.ibew.org
International Electrotechnical Commission - www.iec.ch
Mine Safety & Health Administration - www.msha.gov
National Electrical Contractors Association - www.necanet.org
National Electrical Safety Foundation - www.nesf.org
National Fire Protection Association - www.nfpa.org
National Institute of Occupational Safety & Health - www.cdc.gov/niosh/homepage.html
National Safety Council - www.nsc.org
National Standards Systems Network - www.nssn.org
Occupational Safety & Health Administration - www.osha.gov
Safety Online - www.safetyonline.com
Safety Information Resources, Inc. - www.siri.org
Underwriters Laboratory - www.ul.com

Example of a Prescriptive Lockout/Tagout Written Program for Electrical Contractors

Prescriptive Procedures are outlined in 29 CFR 1910.333(b) and NFPA 70E 120.1

See Note to 1910.333(b)(2)(i) that permits 1910.333(b) to be used as a written LOTO procedure.

These prescriptive steps required in 1910.333(b) are supplemented with requirements from 120.1 in NFPA 70E (2015)

DEENERGIZING EQUIPMENT

Six prescriptive steps to deenergize

1910.333(b)(2)(ii) "Deenergizing equipment."

STEP # 1

1910.333(b)(2)(ii)(A) Safe procedures for deenergizing circuits and equipment shall be determined before circuits or equipment are deenergized.
NFPA 70E 120.1(1) Determine all possible sources of electrical supply to the specific equipment. Check applicable up-to-date drawings, diagrams, and identification tags.

STEP # 2

1910.333(b)(2)(ii)(B) The circuits and equipment to be worked on shall be disconnected from all electric energy sources. Control circuit devices, such as push buttons, selector switches, and interlocks, may not be used as the sole means for deenergizing circuits or equipment. Interlocks for electric equipment may not be used as a substitute for lockout and tagging procedures.
NFPA 70E 120.1(2) After properly interrupting the load current, open the disconnecting device(s) for each source.
NFPA 70E 120.1(3) Wherever possible, visually verify that all blades of the disconnecting devices are fully open or that drawout type circuit breakers are withdrawn to the fully disconnected position.

STEP # 3

1910.333(b)(2)(ii)(C) Stored electric energy which might endanger personnel shall be released. Capacitors shall be discharged and high capacitance elements shall be short-circuited and grounded, if the stored electric energy might endanger personnel.
Note: If the capacitors or associated equipment are handled in meeting this requirement, they shall be treated as energized.

STEP # 4

1910.333(b)(2)(ii)(D) Stored non-electrical energy in devices that could reenergize electric circuit parts shall be blocked or relieved to the extent that the circuit parts could not be accidentally energized by the device.

STEP # 5

1910.333(b)(2)(iii) "Application of locks and tags."
1910.333(b)(2)(iii)(A) A lock and a tag shall be placed on each disconnecting means used to deenergize circuits and equipment on which work is to be performed, except as provided in paragraphs (b)(2)(iii)(C) and (b)(2)(iii)(E) of this section. The lock shall be attached so as to prevent persons from operating the disconnecting means unless they resort to undue force or the use of tools.
NFPA 120.1(4) Apply lockout/tagout devices in accordance with a documented and established policy.
1910.333(b)(2)(iii)(B) Each tag shall contain a statement prohibiting unauthorized operation of the disconnecting means and removal of the tag.
1910.333(b)(2)(iii)(C) If a lock cannot be applied, or if the employer can demonstrate that tagging procedures will provide a level of safety equivalent to that obtained by the use of a lock, a tag may be used without a lock.
1910.333(b)(2)(iii)(D) A tag used without a lock, as permitted by paragraph (b)(2)(iii)(C) of this section, shall be supplemented by at least one additional safety measure that provides a level of safety equivalent to that obtained by use of a lock. Examples of additional safety measures include the removal of an isolating circuit element, blocking of a controlling switch, or opening of an extra disconnecting device.
1910.333(b)(2)(iii)(E) A lock may be placed without a tag only under the following conditions:
1910.333(b)(2)(iii)(E)(1) Only one circuit or piece of equipment is deenergized, and
1910.333(b)(2)(iii)(E)(2) The lockout period does not extend beyond the work shift, and
1910.333(b)(2)(iii)(E)(3) Employees exposed to the hazards associated with reenergizing the circuit or equipment are familiar with this procedure.

STEP # 6

1910.333(b)(2)(iv) Verification of deenergized condition. The requirements of this paragraph shall be met before any circuits or equipment can be considered and worked as deenergized.
1910.333(b)(2)(iv)(A) A qualified person shall operate the equipment operating controls or otherwise verify that the equipment cannot be restarted.
1910.333(b)(2)(iv)(B) A qualified person shall use test equipment to test the circuit elements and electrical parts of equipment to which employees will be exposed and shall verify that the circuit elements and equipment parts are deenergized. The test shall also determine if any energized condition exists as a result of inadvertently induced voltage or unrelated voltage backfeed even though specific parts of the circuit have been deenergized and presumed to be safe. If the circuit to be tested is over 600 volts, nominal, the test equipment shall be checked for proper operation immediately after this test.

NFPA 70E 120.1(5) Use an adequately rated test instrument to test each phase conductor or circuit part to verify they are deenergized. Test each phase conductor or circuit part both phase-to-phase and phase-to-ground. Before and after each test, determine that the test instrument is operating satisfactorily through verification on a known voltage source. Informational Note: See ANSI/ISA-61010-1 (82.02.01)/UL 61010-1, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements, for rating and design requirements for voltage measurement and test instruments intended for use on electrical systems 1000 V and below.

NFPA 70E 120.1(6) Where the possibility of induced voltages or stored electrical energy exists, ground the phase conductors or circuit parts before touching them. Where it could be reasonably anticipated that the conductors or circuit parts being de-energized could contact other exposed energized conductors or circuit parts, apply ground connecting devices rated for the available fault duty.

REENERGIZING EQUIPMENT

Four prescriptive steps to reenergize

1910.333(b)(2)(v) "Reenergizing equipment." These requirements shall be met, in the order given, before circuits or equipment are reenergized, even temporarily.

STEP # 1

1910.333(b)(2)(v)(A) A qualified person shall conduct tests and visual inspections, as necessary, to verify that all tools, electrical jumpers, shorts, grounds, and other such devices have been removed, so that the circuits and equipment can be safely energized

STEP # 2

1910.333(b)(2)(v)(B) Employees exposed to the hazards associated with reenergizing the circuit or equipment shall be warned to stay clear of circuits and equipment.

STEP # 3

1910.333(b)(2)(v)(C) Each lock and tag shall be removed by the employee who applied it or under his or her direct supervision. However, if this employee is absent from the workplace, then the lock or tag may be removed by a qualified person designated to perform this task provided that:

1910.333(b)(2)(v)(C)(1) The employer ensures that the employee who applied the lock or tag is not available at the workplace, and

1910.333(b)(2)(v)(C)(2) The employer ensures that the employee is aware that the lock or tag has been removed before he or she resumes work at that workplace.

STEP # 4

1910.333(b)(2)(v)(D) There shall be a visual determination that all employees are clear of the circuits and equipment.

REFERENCED REQUIREMENTS

OSHA 1910.333(b)

1910.333(b) "Working on or near exposed deenergized parts.

1910.333(b)(1) "Application." This paragraph applies to work on exposed deenergized parts or near enough to them to expose the employee to any electrical hazard they present. Conductors and parts of electric equipment that have been deenergized but have not been locked out or tagged in accordance with paragraph (b) of this section shall be treated as energized parts, and paragraph (c) of this section applies to work on or near them.

1910.333(b)(2) "Lockout and Tagging." While any employee is exposed to contact with parts of fixed electric equipment or circuits which have been deenergized, the circuits energizing the parts shall be locked out or tagged or both in accordance with the requirements of this paragraph. The requirements shall be followed in the order in which they are presented (i.e., paragraph (b)(2)(i) first, then paragraph (b)(2)(ii), etc.).
Note 1: As used in this section, fixed equipment refers to equipment fastened in place or connected by permanent wiring methods.
Note 2: Lockout and tagging procedures that comply with paragraphs (c) through (f) of 1910.147 will also be deemed to comply with paragraph (b)(2) of this section provided that:
[1] The procedures address the electrical safety hazards covered by this Subpart; and
[2] The procedures also incorporate the requirements of paragraphs (b)(2)(iii)(D) and (b)(2)(iv)(B) of this section.

1910.333(b)(2)(i)

"Procedures." The employer shall maintain a written copy of the procedures outlined in paragraph (b)(2) and shall make it available for inspection by employees and by the Assistant Secretary of Labor and his or her authorized representatives.

Note: The written procedures may be in the form of a copy of paragraph (b) of this section.

1910.333(b)(2)(ii)

"Deenergizing equipment."

1910.333(b)(2)(ii)(A)

Safe procedures for deenergizing circuits and equipment shall be determined before circuits or equipment are deenergized.

1910.333(b)(2)(ii)(B)

The circuits and equipment to be worked on shall be disconnected from all electric energy sources. Control circuit devices, such as push buttons, selector switches, and interlocks, may not be used as the sole means for deenergizing circuits or equipment. Interlocks for electric equipment may not be used as a substitute for lockout and tagging procedures.

1910.333(b)(2)(ii)(C)

Stored electric energy which might endanger personnel shall be released. Capacitors shall be discharged and high capacitance elements shall be short-circuited and grounded, if the stored electric energy might endanger personnel.

Note: If the capacitors or associated equipment are handled in meeting this requirement, they shall be treated as energized.

1910.333(b)(2)(ii)(D)

Stored non-electrical energy in devices that could reenergize electric circuit parts shall be blocked or relieved to the extent that the circuit parts could not be accidentally energized by the device.

1910.333(b)(2)(iii)

"Application of locks and tags."

1910.333(b)(2)(iii)(A)

A lock and a tag shall be placed on each disconnecting means used to deenergize circuits and equipment on which work is to be performed, except as provided in paragraphs (b)(2)(iii)(C) and (b)(2)(iii)(E) of this section. The lock shall be attached so as to prevent persons from operating the disconnecting means unless they resort to undue force or the use of tools.

1910.333(b)(2)(iii)(B)

Each tag shall contain a statement prohibiting unauthorized operation of the disconnecting means and removal of the tag.

1910.333(b)(2)(iii)(C)

If a lock cannot be applied, or if the employer can demonstrate that tagging procedures will provide a level of safety equivalent to that obtained by the use of a lock, a tag may be used without a lock.

1910.333(b)(2)(iii)(D)

A tag used without a lock, as permitted by paragraph (b)(2)(iii)(C) of this section, shall be supplemented by at least one additional safety measure that provides a level of safety equivalent to that obtained by use of a lock. Examples of additional safety measures include the removal of an isolating circuit element, blocking of a controlling switch, or opening of an extra disconnecting device.

1910.333(b)(2)(iii)(E)

A lock may be placed without a tag only under the following conditions:

1910.333(b)(2)(iii)(E)(1)

Only one circuit or piece of equipment is deenergized, and

1910.333(b)(2)(iii)(E)(2)

The lockout period does not extend beyond the work shift, and

1910.333(b)(2)(iii)(E)(3)

Employees exposed to the hazards associated with reenergizing the circuit or equipment are familiar with this procedure.

1910.333(b)(2)(iv)

Verification of deenergized condition. The requirements of this paragraph shall be met before any circuits or equipment can be considered and worked as deenergized.

1910.333(b)(2)(iv)(A)

A qualified person shall operate the equipment operating controls or otherwise verify that the equipment cannot be restarted.

1910.333(b)(2)(iv)(B)

A qualified person shall use test equipment to test the circuit elements and electrical parts of equipment to which employees will be exposed and shall verify that the circuit elements and equipment parts are deenergized. The test shall also determine if any energized condition exists as a result of inadvertently induced voltage or unrelated voltage backfeed even though specific parts of the circuit have been deenergized and presumed to be safe. If the circuit to be tested is over 600 volts, nominal, the test equipment shall be checked for proper operation immediately after this test.

1910.333(b)(2)(v)

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

1910.333(b)(2)(v)(A)

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

1910.333(b)(2)(v)(B)

Employees exposed to the hazards associated with reenergizing the circuit or equipment shall be warned to stay clear of circuits and equipment.

1910.333(b)(2)(v)(C)

Each lock and tag shall be removed by the employee who applied it or under his or her direct supervision. However, if this employee is absent from the workplace, then the lock or tag may be removed by a qualified person designated to perform this task provided that:

1910.333(b)(2)(v)(C)(1)

The employer ensures that the employee who applied the lock or tag is not available at the workplace, and

1910.333(b)(2)(v)(C)(2)

The employer ensures that the employee is aware that the lock or tag has been removed before he or she resumes work at that workplace.

1910.333(b)(2)(v)(D)

There shall be a visual determination that all employees are clear of the circuits and equipment.

2015 NFPA 70E 120.1

120.1 Verification of an Electrically Safe Work Condition.
An electrically safe work condition shall be achieved when performed in accordance with the procedures of 120.2 and verified by the following process:
(1) Determine all possible sources of electrical supply to the specific equipment. Check applicable up-to-date drawings, diagrams, and Identification tags.
(2) After properly interrupting the load current, open the disconnecting device(s) for each

source.
(3) Wherever possible, visually verify that all blades of the disconnecting devices are fully open or that drawout-type circuit breakers are withdrawn to the fully disconnected position.
(4) Apply lockout/tagout devices in accordance with a documented and established policy.
(5) Use an adequately rated test instrument to test each phase conductor or circuit part to verify they are deenergized. Test each phase conductor or circuit part both phase-to-phase and phase-to-ground. Before and after each test, determine that the test instrument is operating satisfactorily through verification on a known voltage source.

Informational Note: See ANSI/ISA-61010-1 (82.02.01)/UL 61010-1, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements, for rating and design requirements for voltage measurement and test instruments intended for use on electrical systems 1000 V and below.

(6) Where the possibility of induced voltages or stored electrical energy exists, ground the phase conductors or circuit parts before touching them. Where it could be reasonably anticipated that the conductors or circuit parts being de-energized could contact other exposed energized conductors or circuit parts, apply ground connecting devices rated for the available fault duty.

PAGODA

LOCK-OUT / TAG-OUT LOG

LOCK NO.	PANEL/AREA	CIRCUIT # / SYSTEM	DATE OUT	DATE IN	FOREMAN/ JW	REMARKS