

NEW SECTION

WAC 296-24-957 Electrical. This part addresses electrical safety requirements that are necessary for the practical safeguarding of employees in their workplaces and is divided into four major divisions as follows:

(1) Design safety standards for electrical systems. These regulations are contained in WAC 296-24-95701 through 296-24-95713. Included in this category are all electric equipment and installations used to provide electric power and light for employee workplaces.

(2) Safety-related work practices. These regulations are contained in WAC 296-24-965.

(3) Definitions. Definitions applicable to each division are contained in WAC 296-24-990.

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WAC 296-24-95701 Electric utilization systems. (1) WAC 296-24-95701 through 296-24-95713 contain design safety standards for electric utilization systems, and cover electrical installations and utilization equipment installed or used within or on buildings, structures, and other premises, including:

- (a) Yards;
- (b) Carnivals;
- (c) Parking and other lots;
- (d) Mobile homes;
- (e) Recreational vehicles;
- (f) Industrial substations;
- (g) Conductors that connect the installations to a supply of electricity; and
- (h) Other outside conductors on the premises.

(2) Not covered. The provisions of WAC 296-24-95701 through 296-24-95713 do not cover:

- (a) Installations in ships, watercraft, railway rolling stock, aircraft, or automotive vehicles other than mobile homes and recreational vehicles;
- (b) Installations underground in mines;
- (c) Installations of railways for generation, transformation, transmission, or distribution of power used exclusively for operation of rolling stock or installations used exclusively for signaling and communication purposes;

(d) Installations of communication equipment under the exclusive control of communication utilities, located outdoors or in building spaces used exclusively for such installations; or

(e) Installations under the exclusive control of electric utilities for the purpose of communication or metering; or for the generation, control, transformation, transmission, and distribution of electric energy located in buildings used exclusively by utilities for such purposes or located outdoors on property owned or leased by the utility or on public highways, streets, roads, etc., or outdoors by established rights on private property.

(3) Extent of application.

(a) Requirements applicable to all installations. The following requirements apply to all electrical installations and utilization equipment, regardless of when they were designed or installed:

WAC 296-24-95703 (3)(c), (4), (5), (6)(a), (b), and (c), and (7)(b);

WAC 296-24-95705 (1)(c), (6)(a)(i), (iv), and (v), and (7)(a)(ii) through (v), (d), (e), (f)(iv)(A) through (D), (f)(vi), and (h)(i);

WAC 296-24-95707 (7)(a) and (b)(ii) and (iii);

WAC 296-24-95711, except as specified in WAC 296-24-95711(2).

(b) Requirements applicable to installations made after March 15, 1972. Every electrical installation and all utilization equipment installed or overhauled after March 15, 1972, shall comply with the provisions in WAC 296-24-95701 through 296-24-95713, except as noted in subsections (3)(c) and (d) of this section.

(c) Requirements applicable only to installations made after April 16, 1981. The following requirements apply only to electrical installations and utilization equipment installed after April 16, 1981:

WAC 296-24-95703 (8)(d);

WAC 296-24-95705 (6)(a)(vii) and (viii) and (7)(i)(i);

WAC 296-24-95707 (10)(f)(ii)(D);

WAC 296-24-95709 (3)(i), (9), and (10)(e);

WAC 296-24-95713 (1)(a), (3)(c), and (4).

(d) Requirements applicable only to installations made after August 13, 2007. The following requirements apply only to electrical installations and utilization equipment installed after August 13, 2007:

WAC 296-24-95703 (6)(d) and (e), (7)(a)(iv) and (vii), and (8)(e)(vi);

WAC 296-24-95705 (2)(a) and (c), (6)(b)(i)(A) and (B) (but not the introductory text to WAC 296-24-95705 (6)(b)(i) and (iv)(A);

WAC 296-24-95707 (3)(c)(ii) and (e);

WAC 296-24-95709 (1)(a)(ii), (3)(d), (e), (f), and (g), (10)(a)(iii), and (11);

WAC 296-24-95713 (1)(e)(v) and (vi)(B), (g), (2)(c), (3)(c), and (6).

(4) Applicability of requirements for disconnecting means. The requirement in WAC 296-803-30005 that energy isolating devices be capable of accepting a lockout device whenever replacement or

major repair, renovation or modification of a machine or equipment is performed, and whenever new machines or equipment are installed after January 2, 1990, applies in addition to any requirements in WAC 296-24-95703 through 296-24-95713 that disconnecting means be capable of being locked in the open position under certain conditions.

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WAC 296-24-95703 General requirements. (1) Approval. The conductors and equipment required or permitted by this part shall be acceptable only if approved, as defined in WAC 296-24-990.

(2) Examination, installation, and use of equipment.

(a) Examination. Electric equipment shall be free from recognized hazards that are likely to cause death or serious physical harm to employees. Safety of equipment shall be determined using the following considerations:

(i) Suitability for installation and use in conformity with the provisions of this part;

Note: Suitability of equipment for an identified purpose may be evidenced by listing or labeling for that identified purpose.

(ii) Mechanical strength and durability, including, for parts designed to enclose and protect other equipment, the adequacy of the protection thus provided;

(iii) Wire-bending and connection space;

(iv) Electrical insulation;

(v) Heating effects under all conditions of use;

(vi) Arcing effects;

(vii) Classification by type, size, voltage, current capacity, and specific use; and

(viii) Other factors that contribute to the practical safeguarding of persons using or likely to come in contact with the equipment.

(b) Installation and use. Listed or labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling.

(c) Insulation integrity. Completed wiring installations shall be free from short circuits and from grounds other than those required or permitted by this part.

(d) Interrupting rating. Equipment intended to interrupt current at fault levels shall have an interrupting rating sufficient for the nominal circuit voltage and the current that is available at the line terminals of the equipment. Equipment intended to interrupt current at other than fault levels shall have an interrupting rating at nominal circuit voltage sufficient for the current that must be interrupted.

(e) Circuit impedance and other characteristics. The overcurrent protective devices, the total impedance, the component short-circuit current ratings, and other characteristics of the

circuit to be protected shall be selected and coordinated to permit the circuit protective devices used to clear a fault to do so without the occurrence of extensive damage to the electrical components of the circuit. This fault shall be assumed to be either between two or more of the circuit conductors, or between any circuit conductor and the grounding conductor or enclosing metal raceway.

(f) Deteriorating agents. Unless identified for use in the operating environment, no conductors or equipment shall be located in damp or wet locations; where exposed to gases, fumes, vapors, liquids, or other agents that have a deteriorating effect on the conductors or equipment; or where exposed to excessive temperatures.

(g) Mechanical execution of work. Electric equipment shall be installed in a neat and workmanlike manner.

(i) Unused openings in boxes, raceways, auxiliary gutters, cabinets, equipment cases, or housings shall be effectively closed to afford protection substantially equivalent to the wall of the equipment.

(ii) Conductors shall be racked to provide ready and safe access in underground and subsurface enclosures that persons enter for installation and maintenance.

(iii) Internal parts of electrical equipment, including busbars, wiring terminals, insulators, and other surfaces, may not be damaged or contaminated by foreign materials such as paint, plaster, cleaners, abrasives, or corrosive residues.

(iv) There shall be no damaged parts that may adversely affect safe operation or mechanical strength of the equipment, such as parts that are broken, bent, cut, or deteriorated by corrosion, chemical action, or overheating.

(h) Mounting and cooling of equipment.

(i) Electric equipment shall be firmly secured to the surface on which it is mounted.

Note: Wooden plugs driven into holes in masonry, concrete, plaster, or similar materials are not considered secure means of fastening electric equipment.

(ii) Electric equipment that depends on the natural circulation of air and convection principles for cooling of exposed surfaces shall be installed so that room airflow over such surfaces is not prevented by walls or by adjacent installed equipment. For equipment designed for floor mounting, clearance between top surfaces and adjacent surfaces shall be provided to dissipate rising warm air.

(iii) Electric equipment provided with ventilating openings shall be installed so that walls or other obstructions do not prevent the free circulation of air through the equipment.

(3) Electrical connections.

(a) General. Because of different characteristics of dissimilar metals:

(i) Devices such as pressure terminal or pressure splicing connectors and soldering lugs shall be identified for the material of the conductor and shall be properly installed and used;

(ii) Conductors of dissimilar metals may not be intermixed in

a terminal or splicing connector where physical contact occurs between dissimilar conductors (such as copper and aluminum, copper and copper-clad aluminum, or aluminum and copper-clad aluminum) unless the device is identified for the purpose and conditions of use; and

(iii) Materials such as solder, fluxes, inhibitors, and compounds, where employed, shall be suitable for the use and shall be of a type that will not adversely affect the conductors, installation, or equipment.

(b) Terminals.

(i) Connection of conductors to terminal parts shall ensure a good connection without damaging the conductors and shall be made by means of pressure connectors (including set-screw type), solder lugs, or splices to flexible leads. However, No. 10 or smaller conductors may be connected by means of wire binding screws or studs and nuts having upturned lugs or equivalent.

(ii) Terminals for more than one conductor and terminals used to connect aluminum shall be so identified.

(c) Splices.

(i) Conductors shall be spliced or joined with splicing devices identified for the use or by brazing, welding, or soldering with a fusible metal or alloy. Soldered splices shall first be spliced or joined to be mechanically and electrically secure without solder and then soldered. All splices and joints and the free ends of conductors shall be covered with an insulation equivalent to that of the conductors or with an insulating device identified for the purpose.

(ii) Wire connectors or splicing means installed on conductors for direct burial shall be listed for such use.

(4) Arcing parts. Parts of electric equipment that in ordinary operation produce arcs, sparks, flames, or molten metal shall be enclosed or separated and isolated from all combustible material.

(5) Marking.

(a) Identification of manufacturer and ratings. Electric equipment may not be used unless the following markings have been placed on the equipment:

(i) The manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the product may be identified; and

(ii) Other markings giving voltage, current, wattage, or other ratings as necessary.

(b) Durability. The marking shall be of sufficient durability to withstand the environment involved.

(6) Disconnecting means and circuits.

(a) Motors and appliances. Each disconnecting means required by this part for motors and appliances shall be legibly marked to indicate its purpose, unless located and arranged so the purpose is evident.

(b) Services, feeders, and branch circuits. Each service, feeder, and branch circuit, at its disconnecting means or overcurrent device, shall be legibly marked to indicate its purpose, unless located and arranged so the purpose is evident.

(c) Durability of markings. The markings required by this section shall be of sufficient durability to withstand the environment involved.

(d) Capable of accepting a lock. Disconnecting means required by this part shall be capable of being locked in the open position.

(e) Marking for series combination ratings.

(i) Where circuit breakers or fuses are applied in compliance with the series combination ratings marked on the equipment by the manufacturer, the equipment enclosures shall be legibly marked in the field to indicate that the equipment has been applied with a series combination rating.

(ii) The marking required by (e)(i) of this subsection shall be readily visible and shall state "Caution--Series Combination System Rated Amperes. Identified Replacement Component Required."

(7) 600 Volts, nominal, or less. This subsection applies to electric equipment operating at 600 volts, nominal, or less to ground.

(a) Space about electric equipment. Sufficient access and working space shall be provided and maintained about all electric equipment to permit ready and safe operation and maintenance of such equipment.

(i) Working space for equipment likely to require examination, adjustment, servicing, or maintenance while energized shall comply with the following dimensions, except as required or permitted elsewhere in this part:

(A) The depth of the working space in the direction of access to live parts may not be less than indicated in Table S-1. Distances shall be measured from the live parts if they are exposed or from the enclosure front or opening if they are enclosed;

(B) The width of working space in front of the electric equipment shall be the width of the equipment or 30 inches, whichever is greater. In all cases, the working space shall permit at least a 90-degree opening of equipment doors or hinged panels; and

(ii) Working space required by this standard may not be used for storage. When normally enclosed live parts are exposed for inspection or servicing, the working space, if in a passageway or general open space, shall be suitably guarded.

(iii) At least one entrance of sufficient area shall be provided to give access to the working space about electric equipment.

(iv) For equipment rated 1200 amperes or more and over 6 feet wide, containing overcurrent devices, switching devices, or control devices, there shall be one entrance not less than 24 inches wide and 6 feet 6 inches high at each end of the working space, except that:

(A) Where the location permits a continuous and unobstructed way of exit travel, one means of exit is permitted; or

(B) Where the working space required by (a)(i) of this subsection is doubled, only one entrance to the working space is required; however, the entrance shall be located so that the edge of the entrance nearest the equipment is the minimum clear distance given in Table S-1 away from such equipment.

(v) Illumination shall be provided for all working spaces about service equipment, switchboards, panelboards, and motor control centers installed indoors. Additional lighting fixtures are not required where the working space is illuminated by an adjacent light source. In electric equipment rooms, the illumination may not be controlled by automatic means only.

(vi) The minimum headroom of working spaces about service equipment, switchboards, panelboards, or motor control centers shall be as follows:

(A) For installations built before August 13, 2007, 6 feet 3 inches; and

(B) For installations built on or after August 13, 2007, 6 feet 6 inches, except that where the electrical equipment exceeds 6 feet 6 inches in height, the minimum headroom may not be less than the height of the equipment.

Table S-1--Minimum Depth of Clear Working Space at Electric Equipment, 600 V or Less

Nominal voltage to ground	Minimum clear distance for condition ^{2,3}		
	Condition A	Condition B	Condition C
	ft	ft	ft
0 - 150	3.0	3.0	3.0
151 - 600	3.01	3.5	4.0

Notes to Table S-1:

¹ Minimum clear distances may be 2 feet 6 inches for installations built before April 16, 1981.

² Conditions A, B, and C are as follows:

Condition A--Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by suitable wood or other insulating material. Insulated wire or insulated busbars operating at not over 300 volts are not considered live parts.

Condition B--Exposed live parts on one side and grounded parts on the other side.

Condition C--Exposed live parts on both sides of the work space (not guarded as provided in Condition A) with the operator between.

³ Working space is not required in back of assemblies such as dead-front switchboards or motor control centers where there are no renewable or adjustable parts (such as fuses or switches) on the back and where all connections are accessible from locations other than the back. Where rear access is required to work on deenergized parts on the back of enclosed equipment, a minimum working space of 30 inches horizontally shall be provided.

(vii) Switchboards, panelboards, and distribution boards installed for the control of light and power circuits, and motor control centers shall be located in dedicated spaces and protected from damage.

(A) For indoor installation, the dedicated space shall comply with the following:

(I) The space equal to the width and depth of the equipment and extending from the floor to a height of 6 feet above the equipment or to the structural ceiling, whichever is lower, shall be dedicated to the electrical installation. Unless isolated from equipment by height or physical enclosures or covers that will afford adequate mechanical protection from vehicular traffic or accidental contact by unauthorized personnel or that complies with (a)(vii)(A)(II) of this subsection, piping, ducts, or equipment foreign to the electrical installation may not be located in this area;

(II) The space equal to the width and depth of the equipment shall be kept clear of foreign systems unless protection is provided to avoid damage from condensation, leaks, or breaks in such foreign systems. This area shall extend from the top of the electric equipment to the structural ceiling;

(III) Sprinkler protection is permitted for the dedicated space where the piping complies with this section; and

(IV) Control equipment that by its very nature or because of other requirements in this part must be adjacent to or within sight of its operating machinery is permitted in the dedicated space.

Note: A dropped, suspended, or similar ceiling that does not add strength to the building structure is not considered a structural ceiling.

(B) Outdoor electric equipment shall be installed in suitable enclosures and shall be protected from accidental contact by unauthorized personnel, or by vehicular traffic, or by accidental spillage or leakage from piping systems. No architectural appurtenance or other equipment may be located in the working space required by (a)(i) of this subsection.

(b) Guarding of live parts.

(i) Except as elsewhere required or permitted by this standard, live parts of electric equipment operating at 50 volts or more shall be guarded against accidental contact by use of approved cabinets or other forms of approved enclosures or by any of the following means:

(A) By location in a room, vault, or similar enclosure that is accessible only to qualified persons;

(B) By suitable permanent, substantial partitions or screens so arranged so that only qualified persons will have access to the space within reach of the live parts. Any openings in such partitions or screens shall be so sized and located that persons are not likely to come into accidental contact with the live parts or to bring conducting objects into contact with them;

(C) By placement on a suitable balcony, gallery, or platform so elevated and otherwise located as to prevent access by unqualified persons; or

(D) By elevation of 8 feet or more above the floor or other working surface.

(ii) In locations where electric equipment would be exposed to physical damage, enclosures or guards shall be so arranged and of such strength as to prevent such damage.

(iii) Entrances to rooms and other guarded locations containing exposed live parts shall be marked with conspicuous warning signs forbidding unqualified persons to enter.

(8) Over 600 volts, nominal.

(a) General. Conductors and equipment used on circuits exceeding 600 volts, nominal, shall comply with all applicable provisions of subsections (1) through (7) of this section and with the following provisions, which supplement or modify the preceding requirements. However, (b) through (d) of this subsection do not apply to the equipment on the supply side of the service point.

(b) Enclosure for electrical installations.

(i) Electrical installations in a vault, room, or closet or in

an area surrounded by a wall, screen, or fence, access to which is controlled by lock and key or other approved means, are considered to be accessible to qualified persons only. The type of enclosure used in a given case shall be designed and constructed according to the hazards associated with the installation.

(ii) For installations other than equipment described in (b)(v) of this subsection, a wall, screen, or fence shall be used to enclose an outdoor electrical installation to deter access by persons who are not qualified. A wall, screen, or fence less than 8 feet in height is not considered to prevent access unless it has other features that provide a degree of isolation equivalent to an 8 foot fence.

(iii) The following requirements apply to indoor installations that are accessible to other than qualified persons:

(A) The installations shall be made with metal-enclosed equipment or shall be enclosed in a vault or in an area to which access is controlled by a lock;

(B) Metal-enclosed switchgear, unit substations, transformers, pull boxes, connection boxes, and other similar associated equipment shall be marked with appropriate caution signs; and

(C) Openings in ventilated dry-type transformers and similar openings in other equipment shall be designed so that foreign objects inserted through these openings will be deflected from energized parts.

(iv) Outdoor electrical installations having exposed live parts shall be accessible to qualified persons only.

(v) The following requirements apply to outdoor enclosed equipment accessible to unqualified employees:

(A) Ventilating or similar openings in equipment shall be so designed that foreign objects inserted through these openings will be deflected from energized parts;

(B) Where exposed to physical damage from vehicular traffic, suitable guards shall be provided;

(C) Nonmetallic or metal-enclosed equipment located outdoors and accessible to the general public shall be designed so that exposed nuts or bolts cannot be readily removed, permitting access to live parts;

(D) Where nonmetallic or metal-enclosed equipment is accessible to the general public and the bottom of the enclosure is less than 8 feet above the floor or grade level, the enclosure door or hinged cover shall be kept locked; and

(E) Except for underground box covers that weigh over 100 pounds, doors and covers of enclosures used solely as pull boxes, splice boxes, or junction boxes shall be locked, bolted, or screwed on.

(c) Work space about equipment. Sufficient space shall be provided and maintained about electric equipment to permit ready and safe operation and maintenance of such equipment. Where energized parts are exposed, the minimum clear work space may not be less than 6 feet 6 inches high (measured vertically from the floor or platform) or less than 3 feet wide (measured parallel to the equipment). The depth shall be as required in (e)(i) of this subsection. In all cases, the work space shall be adequate to

permit at least a 90-degree opening of doors or hinged panels.

(d) Entrance and access to work space.

(i) At least one entrance not less than 24 inches wide and 6 feet 6 inches high shall be provided to give access to the working space about electric equipment.

(A) On switchboard and control panels exceeding 6 feet in width, there shall be one entrance at each end of such boards unless the location of the switchboards and control panels permits a continuous and unobstructed way of exit travel, or unless the work space required in (e)(i) of this subsection is doubled.

(B) Where one entrance to the working space is permitted under the conditions described in (d)(i)(A) of this subsection, the entrance shall be located so that the edge of the entrance nearest the switchboards and control panels is at least the minimum clear distance given in Table S-2 away from such equipment.

(C) Where bare energized parts at any voltage or insulated energized parts above 600 volts, nominal, to ground are located adjacent to such entrance, they shall be suitably guarded.

(ii) Permanent ladders or stairways shall be provided to give safe access to the working space around electric equipment installed on platforms, balconies, mezzanine floors, or in attic or roof rooms or spaces.

(e) Working space and guarding.

(i) Except as elsewhere required or permitted in this part, the minimum clear working space in the direction of access to live parts of electric equipment may not be less than specified in Table S-2. Distances shall be measured from the live parts, if they are exposed, or from the enclosure front or opening, if they are enclosed.

(ii) If switches, cutouts, or other equipment operating at 600 volts, nominal, or less, are installed in a room or enclosure where there are exposed live parts or exposed wiring operating at over 600 volts, nominal, the high-voltage equipment shall be effectively separated from the space occupied by the low-voltage equipment by a suitable partition, fence, or screen. However, switches or other equipment operating at 600 volts, nominal, or less, and serving only equipment within the high-voltage vault, room, or enclosure may be installed in the high-voltage enclosure, room, or vault if accessible to qualified persons only.

(iii) The following requirements apply to the entrances to all buildings, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 volts, nominal:

(A) The entrances shall be kept locked unless they are under the observation of a qualified person at all times; and

(B) Permanent and conspicuous warning signs shall be provided, reading substantially as follows: "DANGER--HIGH VOLTAGE--KEEP OUT."

(iv) Illumination shall be provided for all working spaces about electric equipment.

(A) The lighting outlets shall be arranged so that persons changing lamps or making repairs on the lighting system will not be endangered by live parts or other equipment.

(B) The points of control shall be located so that persons are prevented from contacting any live part or moving part of the

equipment while turning on the lights.

(v) Unguarded live parts above working space shall be maintained at elevations not less than specified in Table S-3.

(vi) Pipes or ducts that are foreign to the electrical installation and that require periodic maintenance or whose malfunction would endanger the operation of the electrical system may not be located in the vicinity of service equipment, metal-enclosed power switchgear, or industrial control assemblies. Protection shall be provided where necessary to avoid damage from condensation leaks and breaks in such foreign systems.

Note: Piping and other facilities are not considered foreign if provided for fire protection of the electrical installation.

Table S-2--Minimum Depth of Clear Working Space at Electric Equipment, Over 600 V

Nominal voltage to ground	Minimum clear distance for condition ^{2,3}		
	Condition A	Condition B	Condition C
	ft	ft	ft
601-2500 V	3.0	4.0	5.0
2501-9000 V	4.0	5.0	6.0
9001 V-25 kV	5.0	6.0	9.0
Over 25-75 kV ¹	6.0	8.0	10.0
Above 75 kV ¹	8.0	10.0	12.0

Notes to Table S-2:

- ¹ Minimum depth of clear working space in front of electric equipment with a nominal voltage to ground above 25,000 volts may be the same as that for 25,000 volts under Conditions A, B, and C for installations built before April 16, 1981.
- ² Conditions A, B, and C are as follows:
 Condition A--Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by suitable wood or other insulating material. Insulated wire or insulated busbars operating at not over 300 volts are not considered live parts.
 Condition B--Exposed live parts on one side and grounded parts on the other side. Concrete, brick, and tile walls are considered as grounded surfaces.
 Condition C--Exposed live parts on both sides of the work space (not guarded as provided in Condition A) with the operator between.
- ³ Working space is not required in back of equipment such as dead-front switchboards or control assemblies that has no renewable or adjustable parts (such as fuses or switches) on the back and where all connections are accessible from locations other than the back. Where rear access is required to work on deenergized parts on the back of enclosed equipment, a minimum working space of 30 inches horizontally shall be provided.

Table S-3--Elevation of Unguarded Live Parts Above Working Space

Nominal voltage between phases	Elevation
	ft
601-7500 V	9.0
7501 V-35 kV	9.0
Over 35 kV	9.0 + 0.37 in/kV over 35 kV

¹ The minimum elevation may be 8 feet 6 inches for installations built before August 13, 2007. The minimum elevation may be 8 feet for installations built before April 16, 1981, if the nominal voltage between phases is in the range of 601-6600 volts.

NEW SECTION

WAC 296-24-95705 Wiring design and protection. (1) Use and identification of grounded and grounding conductors.

(a) Identification of conductors.

(i) A conductor used as a grounded conductor shall be identifiable and distinguishable from all other conductors.

(ii) A conductor used as an equipment grounding conductor shall be identifiable and distinguishable from all other conductors.

(b) Polarity of connections. No grounded conductor may be attached to any terminal or lead so as to reverse designated polarity.

(c) Use of grounding terminals and devices. A grounding terminal or grounding-type device on a receptacle, cord connector, or attachment plug may not be used for purposes other than grounding.

(2) Branch circuits.

(a) Identification of multiwire branch circuits. Where more than one nominal voltage system exists in a building containing multiwire branch circuits, each ungrounded conductor of a multiwire branch circuit, where accessible, shall be identified by phase and system. The means of identification shall be permanently posted at each branch-circuit panelboard.

(b) Receptacles and cord connectors.

(i) Receptacles installed on 15- and 20-ampere branch circuits shall be of the grounding type except as permitted for replacement receptacles in (b)(iv) of this subsection. Grounding-type receptacles shall be installed only on circuits of the voltage class and current for which they are rated, except as provided in Table S-4 and Table S-5.

(ii) Receptacles and cord connectors having grounding contacts shall have those contacts effectively grounded except for receptacles mounted on portable and vehicle-mounted generators in accordance with subsection (7)(c) of this section and replacement receptacles installed in accordance with (b)(iv) of this subsection.

(iii) The grounding contacts of receptacles and cord connectors shall be grounded by connection to the equipment grounding conductor of the circuit supplying the receptacle or cord connector. The branch circuit wiring method shall include or provide an equipment grounding conductor to which the grounding contacts of the receptacle or cord connector shall be connected.

(iv) Replacement of receptacles shall comply with the following requirements:

(A) Where a grounding means exists in the receptacle enclosure or a grounding conductor is installed, grounding-type receptacles shall be used and shall be connected to the grounding means or conductor;

(B) Ground-fault circuit-interrupter protected receptacles shall be provided where replacements are made at receptacle outlets that are required to be so protected elsewhere in this part; and

(C) Where a grounding means does not exist in the receptacle

enclosure, the installation shall comply with one of the following provisions:

(I) A nongrounding-type receptacle may be replaced with another nongrounding-type receptacle; or

(II) A nongrounding-type receptacle may be replaced with a ground-fault circuit-interrupter-type of receptacle that is marked "No Equipment Ground;" an equipment grounding conductor may not be connected from the ground-fault circuit-interrupter-type receptacle to any outlet supplied from the ground-fault circuit-interrupter receptacle; or

(III) A nongrounding-type receptacle may be replaced with a grounding-type receptacle where supplied through a ground-fault circuit-interrupter; the replacement receptacle shall be marked "GFCI Protected" and "No Equipment Ground;" an equipment grounding conductor may not be connected to such grounding-type receptacles.

(v) Receptacles connected to circuits having different voltages, frequencies, or types of current (AC or DC) on the same premises shall be of such design that the attachment plugs used on these circuits are not interchangeable.

(c) Ground-fault circuit interrupter protection for personnel.

(i) All 125-volt, single-phase, 15- and 20-ampere receptacles installed in bathrooms or on rooftops shall have ground-fault circuit-interrupter protection for personnel.

(ii) The following requirements apply to temporary wiring installations that are used during construction-like activities, including certain maintenance, remodeling, or repair activities, involving buildings, structures or equipment.

(A) All 125-volt, single-phase, 15-, 20-, and 30-ampere receptacle outlets that are not part of the permanent wiring of the building or structure and that are in use by personnel shall have ground-fault circuit-interrupter protection for personnel.

Note 1: A cord connector on an extension cord set is considered to be a receptacle outlet if the cord set is used for temporary electric power.

Note 2: Cord sets and devices incorporating the required ground-fault circuit-interrupter that are connected to the receptacle closest to the source of power are acceptable forms of protection.

(B) Receptacles other than 125 volt, single-phase, 15-, 20-, and 30-ampere receptacles that are not part of the permanent wiring of the building or structure and that are in use by personnel shall have ground-fault circuit-interrupter protection for personnel.

(C) Where the ground-fault circuit-interrupter protection required by (c)(ii)(B) of this subsection is not available for receptacles other than 125-volt, single-phase, 15-, 20-, and 30-ampere, the employer shall establish and implement an assured equipment grounding conductor program covering cord sets, receptacles that are not a part of the building or structure, and equipment connected by cord and plug that are available for use or used by employees on those receptacles. This program shall comply with the following requirements:

(I) A written description of the program, including the specific procedures adopted by the employer, shall be available at the job site for inspection and copying by the director and their authorized representative, and any affected employee;

(II) The employer shall designate one or more competent

persons to implement the program;

(III) Each cord set, attachment cap, plug, and receptacle of cord sets, and any equipment connected by cord and plug, except cord sets and receptacles which are fixed and not exposed to damage, shall be visually inspected before each day's use for external defects, such as deformed or missing pins or insulation damage, and for indications of possible internal damage. Equipment found damaged or defective shall not be used until repaired;

(IV) The following tests shall be performed on all cord sets and receptacles which are not a part of the permanent wiring of the building or structure, and cord- and plug-connected equipment required to be grounded:

- All equipment grounding conductors shall be tested for continuity and shall be electrically continuous;

- Each receptacle and attachment cap or plug shall be tested for correct attachment of the equipment grounding conductor. The equipment grounding conductor shall be connected to its proper terminal; and

- All required tests shall be performed before first use; before equipment is returned to service following any repairs; before equipment is used after any incident which can be reasonably suspected to have caused damage (for example, when a cord set is run over); and at intervals not to exceed three months, except that cord sets and receptacles which are fixed and not exposed to damage shall be tested at intervals not exceeding six months;

(V) The employer shall not make available or permit the use by employees of any equipment which has not met the requirements of (c)(ii)(C) of this subsection; and

(VI) Tests performed as required in (c)(ii)(C) of this subsection shall be recorded. This test record shall identify each receptacle, cord set, and cord- and plug-connected equipment that passed the test and shall indicate the last date it was tested or the interval for which it was tested. This record shall be kept by means of logs, color coding, or other effective means and shall be maintained until replaced by a more current record. The record shall be made available on the job site for inspection by the assistant secretary and any affected employee.

(d) Outlet devices. Outlet devices shall have an ampere rating not less than the load to be served and shall comply with the following provisions:

(i) Where connected to a branch circuit having a rating in excess of 20 amperes, lampholders shall be of the heavy-duty type. A heavy-duty lampholder shall have a rating of not less than 660 watts if of the admedium type and not less than 750 watts if of any other type; and

(ii) Receptacle outlets shall comply with the following provisions:

(A) A single receptacle installed on an individual branch circuit shall have an ampere rating of not less than that of the branch circuit;

(B) Where connected to a branch circuit supplying two or more receptacles or outlets, a receptacle may not supply a total cord- and plug-connected load in excess of the maximum specified in Table

S-4; and

(C) Where connected to a branch circuit supplying two or more receptacles or outlets, receptacle ratings shall conform to the values listed in Table S-5; or, where larger than 50 amperes, the receptacle rating may not be less than the branch-circuit rating. However, receptacles of cord- and plug-connected arc welders may have ampere ratings not less than the minimum branch-circuit conductor ampacity.

(e) Cord connections. A receptacle outlet shall be installed wherever flexible cords with attachment plugs are used. Where flexible cords are permitted to be permanently connected, receptacles may be omitted.

Table S-4--Maximum Cord- and Plug-Connected Load to Receptacle

Circuit rating (amperes)	Receptacle rating (amperes)	Maximum load (amperes)
15 or 20	15	12
20	20	16
30	30	24

Table S-5--Receptacle Ratings for Various Size Circuits

Circuit rating (amperes)	Receptacle rating (amperes)
15	Not over 15
20	15 or 20
30	30
40	40 or 50
50	50

(3) Outside conductors, 600 volts, nominal, or less. The following requirements apply to branch-circuit, feeder, and service conductors rated 600 volts, nominal, or less and run outdoors as open conductors.

(a) Conductors on poles. Conductors on poles shall have a separation of not less than 1 foot where not placed on racks or brackets. Conductors supported on poles shall provide a horizontal climbing space not less than the following:

(i) Power conductors below communication conductors--30 inches;

(ii) Power conductors alone or above communication conductors:

(A) 300 volts or less--24 inches;

(B) Over 300 volts--30 inches.

(iii) Communication conductors below power conductors--Same as power conductors; and

(iv) Communications conductors alone--No requirement.

(b) Clearance from ground. Open conductors, open multiconductor cables, and service-drop conductors of not over 600 volts, nominal, shall conform to the minimum clearances specified in Table S-6.

Table S-6--Clearances From Ground

Distance	Installations built before August 13, 2007		Installations built on or after August 13, 2007	
	Maximum Voltage	Conditions	Voltage to ground	Conditions
10 feet	< 600 V	Above finished grade or sidewalks, or from any platform or projection from which they might be reached. (If these areas are accessible to other than pedestrian traffic, then one of the other conditions applies.)	< 150 V	Above finished grade or sidewalks, or from any platform or projection from which they might be reached. (If these areas are accessible to other than pedestrian traffic, then one of the other conditions applies.)
12 feet	< 600 V	Over areas, other than public streets, alleys, roads, and driveways, subject to vehicular traffic other than truck traffic.	< 300 V	Over residential property and driveways. Over commercial areas subject to pedestrian traffic or to vehicular traffic other than truck traffic. (This category includes conditions covered under the 3.05 m (10.0 ft) category where the voltage exceeds 150 V.)
4.57 m (15.0 ft)	< 600 V	Over areas, other than public streets, alleys, roads, and driveways, subject to truck traffic.	301 to 600 V	Over residential property and driveways. Over commercial areas subject to pedestrian traffic or to vehicular traffic other than truck traffic. (This category includes conditions covered under the 3.05 m (10.0 ft) category where the voltage exceeds 300 V.)

	Installations built before August 13, 2007		Installations built on or after August 13, 2007	
Distance	Maximum Voltage	Conditions	Voltage to ground	Conditions
5.49 m (18.0 ft)	< 600 V	Over public streets, alleys, roads, and driveways.	< 600 V	Over public streets, alleys, roads, and driveways. Over commercial areas subject to truck traffic. Other land traversed by vehicles, including land used for cultivating or grazing and forests and orchards.

(c) Clearance from building openings.

(i) Service conductors installed as open conductors or multiconductor cable without an overall outer jacket shall have a clearance of not less than 3 feet from windows that are designed to be opened, doors, porches, balconies, ladders, stairs, fire escapes, and similar locations. However, conductors that run above the top level of a window may be less than 3 feet from the window. Vertical clearance of final spans above, or within 3 feet measured horizontally of, platforms, projections, or surfaces from which they might be reached shall be maintained in accordance with (b) of this subsection.

(ii) Overhead service conductors may not be installed beneath openings through which materials may be moved, such as openings in farm and commercial buildings, and may not be installed where they will obstruct entrance to these building openings.

(d) Above roofs. Overhead spans of open conductors and open multiconductor cables shall have a vertical clearance of not less than 8 feet above the roof surface. The vertical clearance above the roof level shall be maintained for a distance not less than 3 feet in all directions from the edge of the roof.

(i) The area above a roof surface subject to pedestrian or vehicular traffic shall have a vertical clearance from the roof surface in accordance with the clearance requirements in (b) of this subsection.

(ii) A reduction in clearance to 3 feet is permitted where the voltage between conductors does not exceed 300 and the roof has a slope of 4 inches in 12 inches or greater.

(iii) A reduction in clearance above only the overhanging portion of the roof to not less than 18 inches is permitted where the voltage between conductors does not exceed 300 if:

(A) The conductors do not pass above the roof overhang for a distance of more than 6 feet, 4 feet horizontally; and

(B) The conductors are terminated at a through-the-roof raceway or approved support.

(iv) The requirement for maintaining a vertical clearance of 3 feet from the edge of the roof does not apply to the final conductor span, where the conductors are attached to the side of a building.

(4) Location of outdoor lamps. Lamps for outdoor lighting shall be located below all energized conductors, transformers, or other electric equipment, unless such equipment is controlled by a disconnecting means that can be locked in the open position, or unless adequate clearances or other safeguards are provided for relamping operations.

(5) Services.

(a) Disconnecting means.

(i) Means shall be provided to disconnect all conductors in a building or other structure from the service-entrance conductors. The service disconnecting means shall plainly indicate whether it is in the open or closed position and shall be installed at a readily accessible location nearest the point of entrance of the service-entrance conductors.

(ii) Each service disconnecting means shall simultaneously disconnect all ungrounded conductors.

(iii) Each service disconnecting means shall be suitable for the prevailing conditions.

(b) Services over 600 volts, nominal. The following additional requirements apply to services over 600 volts, nominal.

(i) Service-entrance conductors installed as open wires shall be guarded to make them accessible only to qualified persons.

(ii) Signs warning of high voltage shall be posted where unqualified employees might come in contact with live parts.

(6) Overcurrent protection.

(a) 600 volts, nominal, or less. The following requirements apply to overcurrent protection of circuits rated 600 volts, nominal, or less.

(i) Conductors and equipment shall be protected from overcurrent in accordance with their ability to safely conduct current.

(ii) Except for motor running overload protection, overcurrent devices may not interrupt the continuity of the grounded conductor unless all conductors of the circuit are opened simultaneously.

(iii) A disconnecting means shall be provided on the supply side of all fuses in circuits over 150 volts to ground and cartridge fuses in circuits of any voltage where accessible to other than qualified persons so that each individual circuit containing fuses can be independently disconnected from the source of power. However, a current-limiting device without a disconnecting means is permitted on the supply side of the service disconnecting means. In addition, a single disconnecting means is permitted on the supply side of more than one set of fuses as permitted by the exception in WAC 296-24-95707 (10)(d)(vi) for group operation of motors, and a single disconnecting means is permitted for fixed electric space-heating equipment.

(iv) Overcurrent devices shall be readily accessible to each employee or authorized building management personnel. These overcurrent devices may not be located where they will be exposed to physical damage or in the vicinity of easily ignitable material.

(v) Fuses and circuit breakers shall be so located or shielded that employees will not be burned or otherwise injured by their operation. Handles or levers of circuit breakers, and similar

parts that may move suddenly in such a way that persons in the vicinity are likely to be injured by being struck by them, shall be guarded or isolated.

(vi) Circuit breakers shall clearly indicate whether they are in the open (off) or closed (on) position.

(vii) Where circuit breaker handles on switchboards are operated vertically rather than horizontally or rotationally, the up position of the handle shall be the closed (on) position.

(viii) Circuit breakers used as switches in 120-volt and 277-volt, fluorescent lighting circuits shall be listed and marked "SWD."

(ix) A circuit breaker with a straight voltage rating, such as 240 V or 480 V, may only be installed in a circuit in which the nominal voltage between any two conductors does not exceed the circuit breaker's voltage rating. A two-pole circuit breaker may not be used for protecting a 3-phase, corner-grounded delta circuit unless the circuit breaker is marked 1Φ -- 3Φ to indicate such suitability. A circuit breaker with a slash rating, such as 120/240 V or 480Y/277 V, may only be installed in a circuit where the nominal voltage of any conductor to ground does not exceed the lower of the two values of the circuit breaker's voltage rating and the nominal voltage between any two conductors does not exceed the higher value of the circuit breaker's voltage rating.

(b) Feeders and branch circuits over 600 volts, nominal. The following requirements apply to feeders and branch circuits energized at more than 600 volts, nominal.

(i) Feeder and branch-circuit conductors shall have overcurrent protection in each ungrounded conductor located at the point where the conductor receives its supply or at a location in the circuit determined under engineering supervision;

(A) Circuit breakers used for overcurrent protection of three-phase circuits shall have a minimum of three overcurrent relays operated from three current transformers. On three-phase, three-wire circuits, an overcurrent relay in the residual circuit of the current transformers may replace one of the phase relays. An overcurrent relay, operated from a current transformer that links all phases of a three-phase, three-wire circuit, may replace the residual relay and one other phase-conductor current transformer. Where the neutral is not grounded on the load side of the circuit, the current transformer may link all three phase conductors and the grounded circuit conductor (neutral); and

(B) If fuses are used for overcurrent protection, a fuse shall be connected in series with each ungrounded conductor;

(ii) Each protective device shall be capable of detecting and interrupting all values of current that can occur at its location in excess of its trip setting or melting point;

(iii) The operating time of the protective device, the available short-circuit current, and the conductor used shall be coordinated to prevent damaging or dangerous temperatures in conductors or conductor insulation under short-circuit conditions; and

(iv) The following additional requirements apply to feeders only:

(A) The continuous ampere rating of a fuse may not exceed three times the ampacity of the conductors. The long-time trip element setting of a breaker or the minimum trip setting of an electronically actuated fuse may not exceed six times the ampacity of the conductor. For fire pumps, conductors may be protected for short circuit only; and

(B) Conductors tapped to a feeder may be protected by the feeder overcurrent device where that overcurrent device also protects the tap conductor.

(7) Grounding. This subsection contains grounding requirements for systems, circuits, and equipment.

(a) Systems to be grounded. Systems that supply premises wiring shall be grounded as follows:

(i) All 3-wire DC systems shall have their neutral conductor grounded;

(ii) Two-wire DC systems operating at over 50 volts through 300 volts between conductors shall be grounded unless:

(A) They supply only industrial equipment in limited areas and are equipped with a ground detector;

(B) They are rectifier-derived from an AC system complying with (a)(iii) through (v) of this subsection; or

(C) They are fire-alarm circuits having a maximum current of 0.030 amperes;

(iii) AC circuits of less than 50 volts shall be grounded if they are installed as overhead conductors outside of buildings or if they are supplied by transformers and the transformer primary supply system is ungrounded or exceeds 150 volts to ground;

(iv) AC systems of 50 volts to 1000 volts shall be grounded under any of the following conditions, unless exempted by (a)(v) of this subsection:

(A) If the system can be so grounded that the maximum voltage to ground on the ungrounded conductors does not exceed 150 volts;

(B) If the system is nominally rated three-phase, four-wire wye connected in which the neutral is used as a circuit conductor;

(C) If the system is nominally rated three-phase, four-wire delta connected in which the midpoint of one phase is used as a circuit conductor; or

(D) If a service conductor is uninsulated;

(v) AC systems of 50 volts to 1000 volts are not required to be grounded under any of the following conditions:

(A) If the system is used exclusively to supply industrial electric furnaces for melting, refining, tempering, and the like;

(B) If the system is separately derived and is used exclusively for rectifiers supplying only adjustable speed industrial drives;

(C) If the system is separately derived and is supplied by a transformer that has a primary voltage rating less than 1000 volts, provided all of the following conditions are met:

(I) The system is used exclusively for control circuits;

(II) The conditions of maintenance and supervision ensure that only qualified persons will service the installation;

(III) Continuity of control power is required; and

(IV) Ground detectors are installed on the control system;

(D) If the system is an isolated power system that supplies circuits in health care facilities; or

(E) If the system is a high-impedance grounded neutral system in which a grounding impedance, usually a resistor, limits the ground-fault current to a low value for 3-phase AC systems of 480 volts to 1000 volts provided all of the following conditions are met:

(I) The conditions of maintenance and supervision ensure that only qualified persons will service the installation;

(II) Continuity of power is required;

(III) Ground detectors are installed on the system; and

(IV) Line-to-neutral loads are not served.

(b) Conductor to be grounded. The conductor to be grounded for AC premises wiring systems required to be grounded by (a) of this subsection shall be as follows:

(i) One conductor of a single-phase, two-wire system shall be grounded;

(ii) The neutral conductor of a single-phase, three-wire system shall be grounded;

(iii) The common conductor of a multiphase system having one wire common to all phases shall be grounded;

(iv) One phase conductor of a multiphase system where one phase is grounded shall be grounded; and

(v) The neutral conductor of a multiphase system in which one phase is used as a neutral conductor shall be grounded.

(c) Portable and vehicle-mounted generators.

(i) The frame of a portable generator need not be grounded and may serve as the grounding electrode for a system supplied by the generator under the following conditions:

(A) The generator supplies only equipment mounted on the generator or cord- and plug-connected equipment through receptacles mounted on the generator, or both; and

(B) The noncurrent-carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles are bonded to the generator frame.

(ii) The frame of a vehicle need not be grounded and may serve as the grounding electrode for a system supplied by a generator located on the vehicle under the following conditions:

(A) The frame of the generator is bonded to the vehicle frame;

(B) The generator supplies only equipment located on the vehicle and cord- and plug-connected equipment through receptacles mounted on the vehicle;

(C) The noncurrent-carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles are bonded to the generator frame; and

(D) The system complies with all other provisions of this subsection.

(iii) A system conductor that is required to be grounded by the provisions in (b) of this subsection shall be bonded to the generator frame where the generator is a component of a separately derived system.

(d) Grounding connections.

(i) For a grounded system, a grounding electrode conductor

shall be used to connect both the equipment grounding conductor and the grounded circuit conductor to the grounding electrode. Both the equipment grounding conductor and the grounding electrode conductor shall be connected to the grounded circuit conductor on the supply side of the service disconnecting means or on the supply side of the system disconnecting means or overcurrent devices if the system is separately derived.

(ii) For an ungrounded service-supplied system, the equipment grounding conductor shall be connected to the grounding electrode conductor at the service equipment. For an ungrounded separately derived system, the equipment grounding conductor shall be connected to the grounding electrode conductor at, or ahead of, the system disconnecting means or overcurrent devices.

(iii) On extensions of existing branch circuits that do not have an equipment grounding conductor, grounding-type receptacles may be grounded to a grounded cold water pipe near the equipment if the extension was installed before August 13, 2007. When any element of this branch circuit is replaced, the entire branch circuit shall use an equipment grounding conductor that complies with all other provisions of this subsection.

(e) Grounding path. The path to ground from circuits, equipment, and enclosures shall be permanent, continuous, and effective.

(f) Supports, enclosures, and equipment to be grounded.

(i) Metal cable trays, metal raceways, and metal enclosures for conductors shall be grounded, except that:

(A) Metal enclosures such as sleeves that are used to protect cable assemblies from physical damage need not be grounded; and

(B) Metal enclosures for conductors added to existing installations of open wire, knob-and-tube wiring, and nonmetallic-sheathed cable need not be grounded if all of the following conditions are met:

(I) Runs are less than 25 feet;

(II) Enclosures are free from probable contact with ground, grounded metal, metal laths, or other conductive materials; and

(III) Enclosures are guarded against employee contact.

(ii) Metal enclosures for service equipment shall be grounded.

(iii) Frames of electric ranges, wall-mounted ovens, counter-mounted cooking units, clothes dryers, and metal outlet or junction boxes that are part of the circuit for these appliances shall be grounded.

(iv) Exposed noncurrent-carrying metal parts of fixed equipment that may become energized shall be grounded under any of the following conditions:

(A) If within 8 feet vertically or 5 feet horizontally of ground or grounded metal objects and subject to employee contact;

(B) If located in a wet or damp location and not isolated;

(C) If in electrical contact with metal;

(D) If in a hazardous (classified) location;

(E) If supplied by a metal-clad, metal-sheathed, or grounded metal raceway wiring method; or

(F) If equipment operates with any terminal at over 150 volts to ground.

(v) Notwithstanding the provisions of (f)(iv) of this subsection, exposed noncurrent-carrying metal parts of the following types of fixed equipment need not be grounded:

(A) Enclosures for switches or circuit breakers used for other than service equipment and accessible to qualified persons only;

(B) Electrically heated appliances that are permanently and effectively insulated from ground;

(C) Distribution apparatus, such as transformer and capacitor cases, mounted on wooden poles, at a height exceeding 8 feet above ground or grade level; and

(D) Listed equipment protected by a system of double insulation, or its equivalent, and distinctively marked as such.

(vi) Exposed noncurrent-carrying metal parts of cord- and plug-connected equipment that may become energized shall be grounded under any of the following conditions:

(A) If in hazardous (classified) locations (see WAC 296-24-95711);

(B) If operated at over 150 volts to ground, except for guarded motors and metal frames of electrically heated appliances if the appliance frames are permanently and effectively insulated from ground;

(C) If the equipment is of the following types:

(I) Refrigerators, freezers, and air conditioners;

(II) Clothes-washing, clothes-drying, and dishwashing machines, sump pumps, and electric aquarium equipment;

(III) Hand-held motor-operated tools, stationary and fixed motor-operated tools, and light industrial motor-operated tools;

(IV) Motor-operated appliances of the following types: Hedge clippers, lawn mowers, snow blowers, and wet scrubbers;

(V) Cord- and plug-connected appliances used in damp or wet locations, or by employees standing on the ground or on metal floors or working inside of metal tanks or boilers;

(VI) Portable and mobile X-ray and associated equipment;

(VII) Tools likely to be used in wet and conductive locations; and

(VIII) Portable hand lamps.

(vii) Notwithstanding the provisions of (f)(vi) of this subsection, the following equipment need not be grounded:

(A) Tools likely to be used in wet and conductive locations if supplied through an isolating transformer with an ungrounded secondary of not over 50 volts; and

(B) Listed or labeled portable tools and appliances protected by an approved system of double insulation, or its equivalent. If such a system is employed, the equipment shall be distinctively marked to indicate that the tool or appliance utilizes an approved system of double insulation.

(g) Nonelectrical equipment. The metal parts of the following nonelectrical equipment shall be grounded: Frames and tracks of electrically operated cranes and hoists; frames of nonelectrically driven elevator cars to which electric conductors are attached; hand-operated metal shifting ropes or cables of electric elevators; and metal partitions, grill work, and similar metal enclosures around equipment of over 750 volts between conductors.

(h) Methods of grounding fixed equipment.

(i) Noncurrent-carrying metal parts of fixed equipment, if required to be grounded by this part, shall be grounded by an equipment grounding conductor that is contained within the same raceway, cable, or cord, or runs with or encloses the circuit conductors. For DC circuits only, the equipment grounding conductor may be run separately from the circuit conductors.

(ii) Electric equipment is considered to be effectively grounded if it is secured to, and in electrical contact with, a metal rack or structure that is provided for its support and the metal rack or structure is grounded by the method specified for the noncurrent-carrying metal parts of fixed equipment in (h)(i) of this subsection. Metal car frames supported by metal hoisting cables attached to or running over metal sheaves or drums of grounded elevator machines are also considered to be effectively grounded.

(iii) For installations made before April 16, 1981, electric equipment is also considered to be effectively grounded if it is secured to, and in metallic contact with, the grounded structural metal frame of a building. When any element of this branch circuit is replaced, the entire branch circuit shall use an equipment grounding conductor that complies with all other provisions of subsection (7) of this section.

(i) Grounding of systems and circuits of 1000 volts and over (high voltage). If high voltage systems are grounded, they shall comply with all applicable provisions of (a) through (h) of this subsection as supplemented and modified by the following requirements:

(i) Systems supplying portable or mobile high voltage equipment, other than substations installed on a temporary basis, shall comply with the following:

(A) The system shall have its neutral grounded through an impedance. If a delta-connected high voltage system is used to supply the equipment, a system neutral shall be derived.

(B) Exposed noncurrent-carrying metal parts of portable and mobile equipment shall be connected by an equipment grounding conductor to the point at which the system neutral impedance is grounded.

(C) Ground-fault detection and relaying shall be provided to automatically deenergize any high voltage system component that has developed a ground fault. The continuity of the equipment grounding conductor shall be continuously monitored so as to deenergize automatically the high voltage feeder to the portable equipment upon loss of continuity of the equipment grounding conductor.

(D) The grounding electrode to which the portable equipment system neutral impedance is connected shall be isolated from and separated in the ground by at least 20 feet from any other system or equipment grounding electrode, and there shall be no direct connection between the grounding electrodes, such as buried pipe, fence, and so forth.

(ii) All noncurrent-carrying metal parts of portable equipment and fixed equipment, including their associated fences, housings,

enclosures, and supporting structures, shall be grounded. However, equipment that is guarded by location and isolated from ground need not be grounded. Additionally, pole-mounted distribution apparatus at a height exceeding 8 feet above ground or grade level need not be grounded.

NEW SECTION

WAC 296-24-95707 Wiring methods, components, and equipment for general use. (1) Wiring methods. The provisions of this section do not apply to conductors that are an integral part of factory-assembled equipment.

(a) General requirements.

(i) Metal raceways, cable trays, cable armor, cable sheath, enclosures, frames, fittings, and other metal noncurrent-carrying parts that are to serve as grounding conductors, with or without the use of supplementary equipment grounding conductors, shall be effectively bonded where necessary to ensure electrical continuity and the capacity to conduct safely any fault current likely to be imposed on them. Any nonconductive paint, enamel, or similar coating shall be removed at threads, contact points, and contact surfaces or be connected by means of fittings designed so as to make such removal unnecessary.

(ii) Where necessary for the reduction of electrical noise (electromagnetic interference) of the grounding circuit, an equipment enclosure supplied by a branch circuit may be isolated from a raceway containing circuits supplying only that equipment by one or more listed nonmetallic raceway fittings located at the point of attachment of the raceway to the equipment enclosure. The metal raceway shall be supplemented by an internal insulated equipment grounding conductor installed to ground the equipment enclosure.

(iii) No wiring systems of any type may be installed in ducts used to transport dust, loose stock, or flammable vapors. No wiring system of any type may be installed in any duct used for vapor removal or for ventilation of commercial-type cooking equipment, or in any shaft containing only such ducts.

(b) Temporary wiring. Except as specifically modified in this subsection, all other requirements of this part for permanent wiring shall also apply to temporary wiring installations.

(i) Temporary electrical power and lighting installations of 600 volts, nominal, or less may be used only as follows:

(A) During and for remodeling, maintenance, repair or demolition of buildings, structures, or equipment, and similar activities;

(B) For a period not to exceed ninety days for Christmas decorative lighting, carnivals, and similar purposes; or

(C) For experimental or development work, and during

emergencies.

(ii) Temporary wiring shall be removed immediately upon completion of the project or purpose for which the wiring was installed.

(iii) Temporary electrical installations of more than 600 volts may be used only during periods of tests, experiments, emergencies, or construction-like activities.

(iv) The following requirements apply to feeders:

(A) Feeders shall originate in an approved distribution center.

(B) Conductors shall be run as multiconductor cord or cable assemblies. However, if installed as permitted in (b)(i)(C) of this subsection, and if accessible only to qualified persons, feeders may be run as single insulated conductors.

(v) The following requirements apply to branch circuits:

(A) Branch circuits shall originate in an approved power outlet or panelboard.

(B) Conductors shall be multiconductor cord or cable assemblies or open conductors. If run as open conductors, they shall be fastened at ceiling height every 10 feet.

(C) No branch-circuit conductor may be laid on the floor.

(D) Each branch circuit that supplies receptacles or fixed equipment shall contain a separate equipment grounding conductor if run as open conductors.

(vi) Receptacles shall be of the grounding type. Unless installed in a continuous grounded metallic raceway or metallic covered cable, each branch circuit shall contain a separate equipment grounding conductor and all receptacles shall be electrically connected to the grounding conductor.

(vii) No bare conductors nor earth returns may be used for the wiring of any temporary circuit.

(viii) Suitable disconnecting switches or plug connectors shall be installed to permit the disconnection of all ungrounded conductors of each temporary circuit. Multiwire branch circuits shall be provided with a means to disconnect simultaneously all ungrounded conductors at the power outlet or panelboard where the branch circuit originated.

Note: Circuit breakers with their handles connected by approved handle ties are considered a single disconnecting means for the purpose of this requirement.

(ix) All lamps for general illumination shall be protected from accidental contact or breakage by a suitable fixture or lampholder with a guard. Brass shell, paper-lined sockets, or other metal-cased sockets may not be used unless the shell is grounded.

(x) Flexible cords and cables shall be protected from accidental damage, as might be caused, for example, by sharp corners, projections, and doorways or other pinch points.

(xi) Cable assemblies and flexible cords and cables shall be supported in place at intervals that ensure that they will be protected from physical damage. Support shall be in the form of staples, cables ties, straps, or similar type fittings installed so as not to cause damage.

(c) Cable trays.

(i) Only the following wiring methods may be installed in cable tray systems: Armored cable; electrical metallic tubing; electrical nonmetallic tubing; fire alarm cables; flexible metal conduit; flexible metallic tubing; instrumentation tray cable; intermediate metal conduit; liquid tight flexible metal conduit; liquid tight flexible nonmetallic conduit; metal-clad cable; mineral-insulated, metal-sheathed cable; multiconductor service-entrance cable; multiconductor underground feeder and branch-circuit cable; multipurpose and communications cables; nonmetallic-sheathed cable; power and control tray cable; power-limited tray cable; optical fiber cables; and other factory-assembled, multiconductor control, signal, or power cables that are specifically approved for installation in cable trays, rigid metal conduit, and rigid nonmetallic conduit.

(ii) In industrial establishments where conditions of maintenance and supervision assure that only qualified persons will service the installed cable tray system, the following cables may also be installed in ladder, ventilated-trough, or ventilated-channel cable trays:

(A) Single conductor cable; the cable shall be No. 1/0 or larger and shall be of a type listed and marked on the surface for use in cable trays; where Nos. 1/0 through 4/0 single conductor cables are installed in ladder cable tray, the maximum allowable rung spacing for the ladder cable tray shall be 9 inches; where exposed to direct rays of the sun, cables shall be identified as being sunlight resistant;

(B) Welding cables installed in dedicated cable trays;

(C) Single conductors used as equipment grounding conductors; these conductors, which may be insulated, covered, or bare, shall be No. 4 or larger; and

(D) Multiconductor cable, Type MV; where exposed to direct rays of the sun, the cable shall be identified as being sunlight resistant.

(iii) Metallic cable trays may be used as equipment grounding conductors only where continuous maintenance and supervision ensure that qualified persons will service the installed cable tray system.

(iv) Cable trays in hazardous (classified) locations may contain only the cable types permitted in such locations. (See WAC 296-24-95711.)

(v) Cable tray systems may not be used in hoistways or where subjected to severe physical damage.

(d) Open wiring on insulators.

(i) Open wiring on insulators is only permitted on systems of 600 volts, nominal, or less for industrial or agricultural establishments, indoors or outdoors, in wet or dry locations, where subject to corrosive vapors, and for services.

(ii) Conductors smaller than No. 8 shall be rigidly supported on noncombustible, nonabsorbent insulating materials and may not contact any other objects. Supports shall be installed as follows:

(A) Within 6 inches from a tap or splice;

(B) Within 12 inches of a dead-end connection to a lampholder

or receptacle; and

(C) At intervals not exceeding 4 feet 6 inches, and at closer intervals sufficient to provide adequate support where likely to be disturbed.

(iii) In dry locations, where not exposed to severe physical damage, conductors may be separately enclosed in flexible nonmetallic tubing. The tubing shall be in continuous lengths not exceeding 15 feet and secured to the surface by straps at intervals not exceeding 4 feet 6 inches.

(iv) Open conductors shall be separated from contact with walls, floors, wood cross members, or partitions through which they pass by tubes or bushings of noncombustible, nonabsorbent insulating material. If the bushing is shorter than the hole, a waterproof sleeve of nonconductive material shall be inserted in the hole and an insulating bushing slipped into the sleeve at each end in such a manner as to keep the conductors absolutely out of contact with the sleeve. Each conductor shall be carried through a separate tube or sleeve.

(v) Where open conductors cross ceiling joints and wall studs and are exposed to physical damage (for example, located within 7 feet of the floor), they shall be protected.

(2) Cabinets, boxes, and fittings.

(a) Conductors entering boxes, cabinets, or fittings.

(i) Conductors entering cutout boxes, cabinets, or fittings shall be protected from abrasion, and openings through which conductors enter shall be effectively closed.

(ii) Unused openings in cabinets, boxes, and fittings shall be effectively closed.

(iii) Where cable is used, each cable shall be secured to the cabinet, cutout box, or meter socket enclosure. However, where cable with an entirely nonmetallic sheath enters the top of a surface-mounted enclosure through one or more nonflexible raceways not less than 18 inches or more than 10 feet in length, the cable need not be secured to the cabinet, box, or enclosure provided all of the following conditions are met:

(A) Each cable is fastened within 12 inches of the outer end of the raceway, measured along the sheath;

(B) The raceway extends directly above the enclosure and does not penetrate a structural ceiling;

(C) A fitting is provided on each end of the raceway to protect the cable from abrasion, and the fittings remain accessible after installation;

(D) The raceway is sealed or plugged at the outer end using approved means so as to prevent access to the enclosure through the raceway;

(E) The cable sheath is continuous through the raceway and extends into the enclosure not less than 0.25 inches beyond the fitting;

(F) The raceway is fastened at its outer end and at other points as necessary; and

(G) Where installed as conduit or tubing, the allowable cable fill does not exceed that permitted for complete conduit or tubing systems.

(b) Covers and canopies.

(i) All pull boxes, junction boxes, and fittings shall be provided with covers identified for the purpose. If metal covers are used, they shall be grounded. In completed installations, each outlet box shall have a cover, faceplate, or fixture canopy. Covers of outlet boxes having holes through which flexible cord pendants pass shall be provided with bushings designed for the purpose or shall have smooth, well-rounded surfaces on which the cords may bear.

(ii) Where a fixture canopy or pan is used, any combustible wall or ceiling finish exposed between the edge of the canopy or pan and the outlet box shall be covered with noncombustible material.

(c) Pull and junction boxes for systems over 600 volts, nominal. In addition to other requirements in this section, the following requirements apply to pull and junction boxes for systems over 600 volts, nominal:

(i) Boxes shall provide a complete enclosure for the contained conductors or cables.

(ii) Boxes shall be closed by suitable covers securely fastened in place.

Note: Underground box covers that weigh over 100 pounds meet this requirement.

(iii) Covers for boxes shall be permanently marked "HIGH VOLTAGE." The marking shall be on the outside of the box cover and shall be readily visible and legible.

(3) Switches.

(a) Single-throw knife switches. Single-throw knife switches shall be so placed that gravity will not tend to close them. Single-throw knife switches approved for use in the inverted position shall be provided with a locking device that will ensure that the blades remain in the open position when so set.

(b) Double-throw knife switches. Double-throw knife switches may be mounted so that the throw will be either vertical or horizontal. However, if the throw is vertical, a locking device shall be provided to ensure that the blades remain in the open position when so set.

(c) Connection of switches.

(i) Single-throw knife switches and switches with butt contacts shall be connected so that the blades are deenergized when the switch is in the open position.

(ii) Single-throw knife switches, molded-case switches, switches with butt contacts, and circuit breakers used as switches shall be connected so that the terminals supplying the load are deenergized when the switch is in the open position. However, blades and terminals supplying the load of a switch may be energized when the switch is in the open position where the switch is connected to circuits or equipment inherently capable of providing a backfeed source of power. For such installations, a permanent sign shall be installed on the switch enclosure or immediately adjacent to open switches that read, "WARNING--LOAD SIDE TERMINALS MAY BE ENERGIZED BY BACKFEED."

(d) Faceplates for flush-mounted snap switches. Snap switches

mounted in boxes shall have faceplates installed so as to completely cover the opening and seat against the finished surface.

(e) Grounding. Snap switches, including dimmer switches, shall be effectively grounded and shall provide a means to ground metal faceplates, whether or not a metal faceplate is installed. However, if no grounding means exists within the snap-switch enclosure, or where the wiring method does not include or provide an equipment ground, a snap switch without a grounding connection is permitted for replacement purposes only. Such snap switches shall be provided with a faceplate of nonconducting, noncombustible material if they are located within reach of conducting floors or other conducting surfaces.

(4) Switchboards and panelboards.

(a) Switchboards with exposed live parts. Switchboards that have any exposed live parts shall be located in permanently dry locations and shall be accessible only to qualified persons.

(b) Panelboard enclosures. Panelboards shall be mounted in cabinets, cutout boxes, or enclosures designed for the purpose and shall be dead front. However, panelboards other than the dead front externally operable type are permitted where accessible only to qualified persons.

(c) Knife switches mounted in switchboards or panelboards. Exposed blades of knife switches mounted in switchboards or panelboards shall be dead when open.

(5) Enclosures for damp or wet locations.

(a) Cabinets, cutout boxes, fittings, boxes, and panelboard enclosures. Cabinets, cutout boxes, fittings, boxes, and panelboard enclosures in damp or wet locations shall be installed so as to prevent moisture or water from entering and accumulating within the enclosures and shall be mounted so there is at least 0.25 inches airspace between the enclosure and the wall or other supporting surface. However, nonmetallic enclosures may be installed without the airspace on a concrete, masonry, tile, or similar surface. The enclosures shall be weatherproof in wet locations.

(b) Switches, circuit breakers, and switchboards. Switches, circuit breakers, and switchboards installed in wet locations shall be enclosed in weatherproof enclosures.

(6) Conductors for general wiring.

(a) Insulation. All conductors used for general wiring shall be insulated unless otherwise permitted in this part.

(b) Type. The conductor insulation shall be of a type that is approved for the voltage, operating temperature, and location of use.

(c) Distinguishable. Insulated conductors shall be distinguishable by appropriate color or other suitable means as being grounded conductors, ungrounded conductors, or equipment grounding conductors.

(7) Flexible cords and cables.

(a) Use of flexible cords and cables.

(i) Flexible cords and cables shall be approved for conditions of use and location.

(ii) Flexible cords and cables may be used only for:

- (A) Pendants;
- (B) Wiring of fixtures;
- (C) Connection of portable lamps or appliances;
- (D) Portable and mobile signs;
- (E) Elevator cables;
- (F) Wiring of cranes and hoists;
- (G) Connection of stationary equipment to facilitate their frequent interchange;
- (H) Prevention of the transmission of noise or vibration;
- (I) Appliances where the fastening means and mechanical connections are designed to permit removal for maintenance and repair;
- (J) Data processing cables approved as a part of the data processing system;
- (K) Connection of moving parts; and
- (L) Temporary wiring as permitted in subsection (1)(b) of this section.

(iii) If used as permitted in (a)(ii)(C), (G), or (I) of this subsection, the flexible cord shall be equipped with an attachment plug and shall be energized from an approved receptacle outlet.

(iv) Unless specifically permitted otherwise in (a)(ii) of this subsection, flexible cords and cables may not be used:

- (A) As a substitute for the fixed wiring of a structure;
- (B) Where run through holes in walls, ceilings, or floors;
- (C) Where run through doorways, windows, or similar openings;
- (D) Where attached to building surfaces;
- (E) Where concealed behind building walls, ceilings, or floors; or
- (F) Where installed in raceways, except as otherwise permitted in this part.

(v) Flexible cords used in show windows and showcases shall be Type S, SE, SEO, SEOO, SJ, SJE, SJEO, SJEOO, SJO, SJOO, SJT, SJTO, SJTOO, SO, SOO, ST, STO, or STOO, except for the wiring of chain-supported lighting fixtures and supply cords for portable lamps and other merchandise being displayed or exhibited.

(b) Identification, splices, and terminations.

(i) A conductor of a flexible cord or cable that is used as a grounded conductor or an equipment grounding conductor shall be distinguishable from other conductors. Types S, SC, SCE, SCT, SE, SEO, SEOO, SJ, SJE, SJEO, SJEOO, SJO, SJT, SJTO, SJTOO, SO, SOO, ST, STO, and STOO flexible cords and Types G, G-GC, PPE, and W flexible cables shall be durably marked on the surface at intervals not exceeding 24 inches with the type designation, size, and number of conductors.

(ii) Flexible cords may be used only in continuous lengths without splice or tap. Hard-service cord and junior hard-service cord No. 12 and larger may be repaired if spliced so that the splice retains the insulation, outer sheath properties, and usage characteristics of the cord being spliced.

(iii) Flexible cords and cables shall be connected to devices and fittings so that strain relief is provided that will prevent pull from being directly transmitted to joints or terminal screws.

(8) Portable cables over 600 volts, nominal. This subsection

applies to portable cables used at more than 600 volts, nominal.

(a) Conductor construction. Multiconductor portable cable for use in supplying power to portable or mobile equipment at over 600 volts, nominal, shall consist of No. 8 or larger conductors employing flexible stranding. However, the minimum size of the insulated ground-check conductor of Type G-GC cables shall be No. 10.

(b) Shielding. Cables operated at over 2,000 volts shall be shielded for the purpose of confining the voltage stresses to the insulation.

(c) Equipment grounding conductors. Grounding conductors shall be provided.

(d) Grounding shields. All shields shall be grounded.

(e) Minimum bending radii. The minimum bending radii for portable cables during installation and handling in service shall be adequate to prevent damage to the cable.

(f) Fittings. Connectors used to connect lengths of cable in a run shall be of a type that lock firmly together. Provisions shall be made to prevent opening or closing these connectors while energized. Strain relief shall be provided at connections and terminations.

(g) Splices. Portable cables may not be operated with splices unless the splices are of the permanent molded, vulcanized, or other approved type.

(h) Terminations. Termination enclosures shall be suitably marked with a high voltage hazard warning, and terminations shall be accessible only to authorized and qualified employees.

(9) Fixture wires.

(a) General. Fixture wires shall be approved for the voltage, temperature, and location of use. A fixture wire which is used as a grounded conductor shall be identified.

(b) Uses permitted. Fixture wires may be used only:

(i) For installation in lighting fixtures and in similar equipment where enclosed or protected and not subject to bending or twisting in use; or

(ii) For connecting lighting fixtures to the branch-circuit conductors supplying the fixtures.

(c) Uses not permitted. Fixture wires may not be used as branch-circuit conductors except as permitted for Class 1 power limited circuits and for fire alarm circuits.

(10) Equipment for general use.

(a) Lighting fixtures, lampholders, lamps, and receptacles.

(i) Fixtures, lampholders, lamps, rosettes, and receptacles may have no live parts normally exposed to employee contact. However, rosettes and cleat-type lampholders and receptacles located at least 8 feet above the floor may have exposed terminals.

(ii) Handlamps of the portable type supplied through flexible cords shall be equipped with a handle of molded composition or other material identified for the purpose, and a substantial guard shall be attached to the lampholder or the handle. Metal shell, paper-lined lampholders may not be used.

(iii) Lampholders of the screw-shell type shall be installed for use as lampholders only. Where supplied by a circuit having a

grounded conductor, the grounded conductor shall be connected to the screw shell. Lampholders installed in wet or damp locations shall be of the weatherproof type.

(iv) Fixtures installed in wet or damp locations shall be identified for the purpose and shall be so constructed or installed that water cannot enter or accumulate in wireways, lampholders, or other electrical parts.

(b) Receptacles, cord connectors, and attachment plugs (caps).

(i) All 15- and 20-ampere attachment plugs and connectors shall be constructed so that there are no exposed current-carrying parts except the prongs, blades, or pins. The cover for wire terminations shall be a part that is essential for the operation of an attachment plug or connector (dead-front construction). Attachment plugs shall be installed so that their prongs, blades, or pins are not energized unless inserted into an energized receptacle. No receptacles may be installed so as to require an energized attachment plug as its source of supply.

(ii) Receptacles, cord connectors, and attachment plugs shall be constructed so that no receptacle or cord connector will accept an attachment plug with a different voltage or current rating than that for which the device is intended. However, a 20-ampere T-slot receptacle or cord connector may accept a 15-ampere attachment plug of the same voltage rating.

(iii) Nongrounding-type receptacles and connectors may not be used for grounding-type attachment plugs.

(iv) A receptacle installed in a wet or damp location shall be suitable for the location.

(v) A receptacle installed outdoors in a location protected from the weather or in other damp locations shall have an enclosure for the receptacle that is weatherproof when the receptacle is covered (attachment plug cap not inserted and receptacle covers closed).

Note: A receptacle is considered to be in a location protected from the weather when it is located under roofed open porches, canopies, marquees, or the like and where it will not be subjected to a beating rain or water runoff.

(vi) A receptacle installed in a wet location where the product intended to be plugged into it is not attended while in use (for example, sprinkler system controllers, landscape lighting, and holiday lights) shall have an enclosure that is weatherproof with the attachment plug cap inserted or removed.

(vii) A receptacle installed in a wet location where the product intended to be plugged into it will be attended while in use (for example, portable tools) shall have an enclosure that is weatherproof when the attachment plug cap is removed.

(c) Appliances.

(i) Appliances may have no live parts normally exposed to contact other than parts functioning as open-resistance heating elements, such as the heating elements of a toaster, which are necessarily exposed.

(ii) Each appliance shall have a means to disconnect it from all ungrounded conductors. If an appliance is supplied by more than one source, the disconnecting means shall be grouped and identified.

(iii) Each electric appliance shall be provided with a nameplate giving the identifying name and the rating in volts and amperes, or in volts and watts. If the appliance is to be used on a specific frequency or frequencies, it shall be so marked. Where motor overload protection external to the appliance is required, the appliance shall be so marked.

(iv) Marking shall be located so as to be visible or easily accessible after installation.

(d) Motors. This subsection applies to motors, motor circuits, and controllers.

(i) If specified that one piece of equipment shall be "within sight of" another piece of equipment, the piece of equipment shall be visible and not more than 50 feet from the other.

(ii) An individual disconnecting means shall be provided for each controller. A disconnecting means shall be located within sight of the controller location. However, a single disconnecting means may be located adjacent to a group of coordinated controllers mounted adjacent to each other on a multimotor continuous process machine. The controller disconnecting means for motor branch circuits over 600 volts, nominal, may be out of sight of the controller, if the controller is marked with a warning label giving the location and identification of the disconnecting means that is to be locked in the open position.

(iii) The disconnecting means shall disconnect the motor and the controller from all ungrounded supply conductors and shall be so designed that no pole can be operated independently.

(iv) The disconnecting means shall plainly indicate whether it is in the open (off) or closed (on) position.

(v) The disconnecting means shall be readily accessible. If more than one disconnect is provided for the same equipment, only one need be readily accessible.

(vi) An individual disconnecting means shall be provided for each motor, but a single disconnecting means may be used for a group of motors under any one of the following conditions:

(A) If a number of motors drive several parts of a single machine or piece of apparatus, such as a metal or woodworking machine, crane, or hoist;

(B) If a group of motors is under the protection of one set of branch-circuit protective devices; or

(C) If a group of motors is in a single room within sight of the location of the disconnecting means.

(vii) Motors, motor-control apparatus, and motor branch-circuit conductors shall be protected against overheating due to motor overloads or failure to start, and against short-circuits or ground faults. These provisions do not require overload protection that will stop a motor where a shutdown is likely to introduce additional or increased hazards, as in the case of fire pumps, or where continued operation of a motor is necessary for a safe shutdown of equipment or process and motor overload sensing devices are connected to a supervised alarm.

(viii) Where live parts of motors or controllers operating at over 150 volts to ground are guarded against accidental contact only by location, and where adjustment or other attendance may be

necessary during the operation of the apparatus, suitable insulating mats or platforms shall be provided so that the attendant cannot readily touch live parts unless standing on the mats or platforms.

(e) Transformers.

(i) This subsection covers the installation of all transformers except the following:

(A) Current transformers;

(B) Dry-type transformers installed as a component part of other apparatus;

(C) Transformers that are an integral part of an X-ray, high frequency, or electrostatic-coating apparatus;

(D) Transformers used with Class 2 and Class 3 circuits, sign and outline lighting, electric discharge lighting, and power-limited fire-alarm circuits; and

(E) Liquid-filled or dry-type transformers used for research, development, or testing, where effective safeguard arrangements are provided.

(ii) The operating voltage of exposed live parts of transformer installations shall be indicated by signs or visible markings on the equipment or structure.

(iii) Dry-type, high fire point liquid-insulated, and askarel-insulated transformers installed indoors and rated over 35 kV shall be in a vault.

(iv) Oil-insulated transformers installed indoors shall be installed in a vault.

(v) Combustible material, combustible buildings and parts of buildings, fire escapes, and door and window openings shall be safeguarded from fires that may originate in oil-insulated transformers attached to or adjacent to a building or combustible material.

(vi) Transformer vaults shall be constructed so as to contain fire and combustible liquids within the vault and to prevent unauthorized access. Locks and latches shall be so arranged that a vault door can be readily opened from the inside.

(vii) Any pipe or duct system foreign to the electrical installation may not enter or pass through a transformer vault.

Note: Piping or other facilities provided for vault fire protection, or for transformer cooling, are not considered foreign to the electrical installation.

(viii) Material may not be stored in transformer vaults.

(f) Capacitors.

(i) All capacitors, except surge capacitors or capacitors included as a component part of other apparatus, shall be provided with an automatic means of draining the stored charge after the capacitor is disconnected from its source of supply.

(ii) The following requirements apply to capacitors installed on circuits operating at more than 600 volts, nominal:

(A) Group-operated switches shall be used for capacitor switching and shall be capable of the following:

(I) Carrying continuously not less than 135 percent of the rated current of the capacitor installation;

(II) Interrupting the maximum continuous load current of each

capacitor, capacitor bank, or capacitor installation that will be switched as a unit;

(III) Withstanding the maximum inrush current, including contributions from adjacent capacitor installations; and

(IV) Carrying currents due to faults on the capacitor side of the switch;

(B) A means shall be installed to isolate from all sources of voltage each capacitor, capacitor bank, or capacitor installation that will be removed from service as a unit. The isolating means shall provide a visible gap in the electric circuit adequate for the operating voltage;

(C) Isolating or disconnecting switches (with no interrupting rating) shall be interlocked with the load interrupting device or shall be provided with prominently displayed caution signs to prevent switching load current; and

(D) For series capacitors, the proper switching shall be assured by use of at least one of the following:

(I) Mechanically sequenced isolating and bypass switches;

(II) Interlocks; or

(III) Switching procedure prominently displayed at the switching location.

(g) Storage batteries. Provisions shall be made for sufficient diffusion and ventilation of gases from storage batteries to prevent the accumulation of explosive mixtures.

NEW SECTION

WAC 296-24-95709 Specific purpose equipment and installations. (1) Electric signs and outline lighting.

(a) Disconnecting means.

(i) Each sign and outline lighting system, or feeder circuit or branch circuit supplying a sign or outline lighting system, shall be controlled by an externally operable switch or circuit breaker that will open all ungrounded conductors. However, a disconnecting means is not required for an exit directional sign located within a building or for cord-connected signs with an attachment plug.

(ii) Signs and outline lighting systems located within fountains shall have the disconnect located at least 5 feet from the inside walls of the fountain.

(b) Location.

(i) The disconnecting means shall be within sight of the sign or outline lighting system that it controls. Where the disconnecting means is out of the line of sight from any section that may be energized, the disconnecting means shall be capable of being locked in the open position.

(ii) Signs or outline lighting systems operated by electronic or electromechanical controllers located external to the sign or

outline lighting system may have a disconnecting means located within sight of the controller or in the same enclosure with the controller. The disconnecting means shall disconnect the sign or outline lighting system and the controller from all ungrounded supply conductors. It shall be designed so no pole can be operated independently and shall be capable of being locked in the open position.

(iii) Doors or covers giving access to uninsulated parts of indoor signs or outline lighting exceeding 600 volts and accessible to other than qualified persons shall either be provided with interlock switches to disconnect the primary circuit or shall be so fastened that the use of other than ordinary tools will be necessary to open them.

(2) Cranes and hoists. This subsection applies to the installation of electric equipment and wiring used in connection with cranes, monorail hoists, hoists, and all runways.

(a) Disconnecting means for runway conductors. A disconnecting means shall be provided between the runway contact conductors and the power supply. Such disconnecting means shall consist of a motor-circuit switch, circuit breaker, or molded case switch. The disconnecting means shall open all ungrounded conductors simultaneously and shall be:

(i) Readily accessible and operable from the ground or floor level;

(ii) Arranged to be locked in the open position; and

(iii) Placed within view of the runway contact conductors.

(b) Disconnecting means for cranes and monorail hoists.

(i) Except as provided in (b)(iv) of this subsection, a motor-circuit switch, molded case switch, or circuit breaker shall be provided in the leads from the runway contact conductors or other power supply on all cranes and monorail hoists.

(ii) The disconnecting means shall be capable of being locked in the open position.

(iii) Means shall be provided at the operating station to open the power circuit to all motors of the crane or monorail hoist where the disconnecting means is not readily accessible from the crane or monorail hoist operating station.

(iv) The disconnecting means may be omitted where a monorail hoist or hand-propelled crane bridge installation meets all of the following conditions:

(A) The unit is controlled from the ground or floor level;

(B) The unit is within view of the power supply disconnecting means; and

(C) No fixed work platform has been provided for servicing the unit.

(c) Limit switch. A limit switch or other device shall be provided to prevent the load block from passing the safe upper limit of travel of any hoisting mechanism.

(d) Clearance. The dimension of the working space in the direction of access to live parts that may require examination, adjustment, servicing, or maintenance while alive shall be a minimum of 2 feet 6 inches. Where controls are enclosed in cabinets, the doors shall either open at least 90 degrees or be

removable.

(3) Elevators, dumbwaiters, escalators, moving walks, wheelchair lifts, and stairway chair lifts. The following requirements apply to elevators, dumbwaiters, escalators, moving walks, wheelchair lifts, and stairway chair lifts.

(a) Disconnecting means. Elevators, dumbwaiters, escalators, moving walks, wheelchair lifts, and stairway chair lifts shall have a single means for disconnecting all ungrounded main power supply conductors for each unit.

(b) Control panels. Control panels not located in the same space as the drive machine shall be located in cabinets with doors or panels capable of being locked closed.

(c) Type. The disconnecting means shall be an enclosed externally operable fused motor circuit switch or circuit breaker capable of being locked in the open position. The disconnecting means shall be a listed device.

(d) Operation. No provision may be made to open or close this disconnecting means from any other part of the premises. If sprinklers are installed in hoistways, machine rooms, or machinery spaces, the disconnecting means may automatically open the power supply to the affected elevators prior to the application of water. No provision may be made to close this disconnecting means automatically (that is, power may only be restored by manual means).

(e) Location. The disconnecting means shall be located where it is readily accessible to qualified persons.

(i) On elevators without generator field control, the disconnecting means shall be located within sight of the motor controller. Driving machines or motion and operation controllers not within sight of the disconnecting means shall be provided with a manually operated switch installed in the control circuit adjacent to the equipment in order to prevent starting. Where the driving machine is located in a remote machinery space, a single disconnecting means for disconnecting all ungrounded main power supply conductors shall be provided and be capable of being locked in the open position.

(ii) On elevators with generator field control, the disconnecting means shall be located within sight of the motor controller for the driving motor of the motor-generator set. Driving machines, motor-generator sets, or motion and operation controllers not within sight of the disconnecting means shall be provided with a manually operated switch installed in the control circuit to prevent starting. The manually operated switch shall be installed adjacent to this equipment. Where the driving machine or the motor-generator set is located in a remote machinery space, a single means for disconnecting all ungrounded main power supply conductors shall be provided and be capable of being locked in the open position.

(iii) On escalators and moving walks, the disconnecting means shall be installed in the space where the controller is located.

(iv) On wheelchair lifts and stairway chair lifts, the disconnecting means shall be located within sight of the motor controller.

(f) Identification and signs.

(i) Where there is more than one driving machine in a machine room, the disconnecting means shall be numbered to correspond to the identifying number of the driving machine that they control.

(ii) The disconnecting means shall be provided with a sign to identify the location of the supply-side overcurrent protective device.

(g) Single-car and multicar installations. On single-car and multicar installations, equipment receiving electrical power from more than one source shall be provided with a disconnecting means for each source of electrical power. The disconnecting means shall be within sight of the equipment served.

(h) Warning sign for multiple disconnecting means. A warning sign shall be mounted on or next to the disconnecting means where multiple disconnecting means are used and parts of the controllers remain energized from a source other than the one disconnected. The sign shall be clearly legible and shall read "WARNING--PARTS OF THE CONTROLLER ARE NOT DEENERGIZED BY THIS SWITCH."

(i) Interconnection between multicar controllers. A warning sign worded as required in (h) of this subsection shall be mounted on or next to the disconnecting means where interconnections between controllers are necessary for the operation of the system on multicar installations that remain energized from a source other than the one disconnected.

(j) Motor controllers. Motor controllers may be located outside the spaces otherwise required by this subsection provided they are in enclosures with doors or removable panels capable of being locked closed and the disconnecting means is located adjacent to or is an integral part of the motor controller. Motor controller enclosures for escalators or moving walks may be located in the balustrade on the side located away from the moving steps or moving treadway. If the disconnecting means is an integral part of the motor controller, it shall be operable without opening the enclosure.

(4) Electric welders--Disconnecting means.

(a) Arc welders. A disconnecting means shall be provided in the supply circuit for each arc welder that is not equipped with a disconnect mounted as an integral part of the welder. The disconnecting means shall be a switch or circuit breaker, and its rating may not be less than that necessary to accommodate overcurrent protection.

(b) Resistance welders. A switch or circuit breaker shall be provided by which each resistance welder and its control equipment can be disconnected from the supply circuit. The ampere rating of this disconnecting means may not be less than the supply conductor ampacity. The supply circuit switch may be used as the welder disconnecting means where the circuit supplies only one welder.

(5) Information technology equipment.

(a) Disconnecting means. A means shall be provided to disconnect power to all electronic equipment in an information technology equipment room. There shall also be a similar means to disconnect the power to all dedicated heating, ventilating, and air-conditioning (HVAC) systems serving the room and to cause all

required fire/smoke dampers to close.

(b) Grouping. The control for these disconnecting means shall be grouped and identified and shall be readily accessible at the principal exit doors. A single means to control both the electronic equipment and HVAC system is permitted.

(c) Exception. Integrated electrical systems covered by WAC 296-24-95713(7) need not have the disconnecting means required by (a) of this subsection.

(6) X-ray equipment. This subsection applies to X-ray equipment.

(a) Disconnecting means.

(i) A disconnecting means shall be provided in the supply circuit. The disconnecting means shall be operable from a location readily accessible from the X-ray control. For equipment connected to a 120-volt branch circuit of 30 amperes or less, a grounding-type attachment plug cap and receptacle of proper rating may serve as a disconnecting means.

(ii) If more than one piece of equipment is operated from the same high-voltage circuit, each piece or each group of equipment as a unit shall be provided with a high-voltage switch or equivalent disconnecting means. The disconnecting means shall be constructed, enclosed, or located so as to avoid contact by employees with its live parts.

(b) Control. The following requirements apply to industrial and commercial laboratory equipment:

(i) Radiographic and fluoroscopic-type equipment shall be effectively enclosed or shall have interlocks that deenergize the equipment automatically to prevent ready access to live current-carrying parts; and

(ii) Diffraction- and irradiation-type equipment shall have a pilot light, readable meter deflection, or equivalent means to indicate when the equipment is energized, unless the equipment or installation is effectively enclosed or is provided with interlocks to prevent access to live current-carrying parts during operation.

(7) Induction and dielectric heating equipment. This subsection applies to induction and dielectric heating equipment and accessories for industrial and scientific applications, but not for medical or dental applications or for appliances.

(a) Guarding and grounding.

(i) The converting apparatus (including the DC line) and high-frequency electric circuits (excluding the output circuits and remote-control circuits) shall be completely contained within enclosures of noncombustible material.

(ii) All panel controls shall be of dead-front construction.

(iii) Doors or detachable panels shall be employed for internal access. Where doors are used giving access to voltages from 500 to 1000 volts AC or DC, either door locks shall be provided or interlocks shall be installed. Where doors are used giving access to voltages of over 1000 volts AC or DC, either mechanical lockouts with a disconnecting means to prevent access until circuit parts within the cubicle are deenergized, or both door interlocking and mechanical door locks, shall be provided. Detachable panels not normally used for access to such parts shall

be fastened in a manner that will make them difficult to remove (for example, by requiring the use of tools).

(iv) Warning labels or signs that read "DANGER--HIGH VOLTAGE--KEEP OUT" shall be attached to the equipment and shall be plainly visible where persons might contact energized parts when doors are opened or closed or when panels are removed from compartments containing over 250 volts AC or DC.

(v) Induction and dielectric heating equipment shall be protected as follows:

(A) Protective cages or adequate shielding shall be used to guard work applicators other than induction heating coils;

(B) Induction heating coils shall be protected by insulation or refractory materials or both;

(C) Interlock switches shall be used on all hinged access doors, sliding panels, or other such means of access to the applicator, unless the applicator is an induction heating coil at DC ground potential or operating at less than 150 volts AC; and

(D) Interlock switches shall be connected in such a manner as to remove all power from the applicator when any one of the access doors or panels is open.

(vi) A readily accessible disconnecting means shall be provided by which each heating equipment can be isolated from its supply circuit. The ampere rating of this disconnecting means may not be less than the nameplate current rating of the equipment. The supply circuit disconnecting means is permitted as a heating equipment disconnecting means where the circuit supplies only one piece of equipment.

(b) Remote control.

(i) If remote controls are used for applying power, a selector switch shall be provided and interlocked to provide power from only one control point at a time.

(ii) Switches operated by foot pressure shall be provided with a shield over the contact button to avoid accidental closing of the switch.

(8) Electrolytic cells. This subsection applies to the installation of the electrical components and accessory equipment of electrolytic cells, electrolytic cell lines, and process power supply for the production of aluminum, cadmium, chlorine, copper, fluorine, hydrogen peroxide, magnesium, sodium, sodium chlorate, and zinc. Cells used as a source of electric energy and for electroplating processes and cells used for production of hydrogen are not covered by this subsection.

(a) Application. Installations covered by subsection (8) of this section shall comply with all applicable provisions of this part, except as follows:

(i) Overcurrent protection of electrolytic cell DC process power circuits need not comply with the requirements of WAC 296-24-95705(6);

(ii) Equipment located or used within the cell line working zone or associated with the cell line DC power circuits need not comply with the provisions of WAC 296-24-95705(7); and

(iii) Electrolytic cells, cell line conductors, cell line attachments, and the wiring of auxiliary equipment and devices

within the cell line working zone need not comply with the provisions of WAC 296-24-95705 or 296-24-95703 (2) and (3).

(b) Disconnecting means. If more than one DC cell line process power supply serves the same cell line, a disconnecting means shall be provided on the cell line circuit side of each power supply to disconnect it from the cell line circuit. Removable links or removable conductors may be used as the disconnecting means.

(c) Portable electric equipment.

(i) The frames and enclosures of portable electric equipment used within the cell line working zone may not be grounded, unless the cell line circuit voltage does not exceed 200 volts DC or the frames are guarded.

(ii) Ungrounded portable electric equipment shall be distinctively marked and shall employ plugs and receptacles of a configuration that prevents connection of this equipment to grounding receptacles and that prevents inadvertent interchange of ungrounded and grounded portable electric equipment.

(d) Power supply circuits and receptacles for portable electric equipment.

(i) Circuits supplying power to ungrounded receptacles for hand-held, cord- and plug-connected equipment shall meet the following requirements:

(A) The circuits shall be electrically isolated from any distribution system supplying areas other than the cell line working zone and shall be ungrounded;

(B) The circuits shall be supplied through isolating transformers with primaries operating at not more than 600 volts between conductors and protected with proper overcurrent protection;

(C) The secondary voltage of the isolating transformers may not exceed 300 volts between conductors; and

(D) All circuits supplied from the secondaries shall be ungrounded and shall have an approved overcurrent device of proper rating in each conductor.

(ii) Receptacles and their mating plugs for ungrounded equipment may not have provision for a grounding conductor and shall be of a configuration that prevents their use for equipment required to be grounded.

(iii) Receptacles on circuits supplied by an isolating transformer with an ungrounded secondary:

(A) Shall have a distinctive configuration;

(B) Shall be distinctively marked; and

(C) May not be used in any other location in the facility.

(e) Fixed and portable electric equipment.

(i) The following need not be grounded:

(A) AC systems supplying fixed and portable electric equipment within the cell line working zone; and

(B) Exposed conductive surfaces, such as electric equipment housings, cabinets, boxes, motors, raceways and the like that are within the cell line working zone.

(ii) Auxiliary electric equipment, such as motors, transducers, sensors, control devices, and alarms, mounted on an

electrolytic cell or other energized surface shall be connected to the premises wiring systems by any of the following means:

(A) Multiconductor hard usage or extra hard usage flexible cord;

(B) Wire or cable in suitable nonmetallic raceways or cable trays; or

(C) Wire or cable in suitable metal raceways or metal cable trays installed with insulating breaks such that they will not cause a potentially hazardous electrical condition.

(iii) Fixed electric equipment may be bonded to the energized conductive surfaces of the cell line, its attachments, or auxiliaries. If fixed electric equipment is mounted on an energized conductive surface, it shall be bonded to that surface.

(f) Auxiliary nonelectrical connections. Auxiliary nonelectrical connections such as air hoses, water hoses, and the like, to an electrolytic cell, its attachments, or auxiliary equipment may not have continuous conductive reinforcing wire, armor, braids, or the like. Hoses shall be of a nonconductive material.

(g) Cranes and hoists.

(i) The conductive surfaces of cranes and hoists that enter the cell line working zone need not be grounded. The portion of an overhead crane or hoist that contacts an energized electrolytic cell or energized attachments shall be insulated from ground.

(ii) Remote crane or hoist controls that may introduce hazardous electrical conditions into the cell line working zone shall employ one or more of the following systems:

(A) Isolated and ungrounded control circuit;

(B) Nonconductive rope operator;

(C) Pendant pushbutton with nonconductive supporting means and with nonconductive surfaces or ungrounded exposed conductive surfaces; or

(D) Radio.

(9) Electrically driven or controlled irrigation machines.

(a) Lightning protection. If an irrigation machine has a stationary point, a grounding electrode system shall be connected to the machine at the stationary point for lightning protection.

(b) Disconnecting means.

(i) The main disconnecting means for a center pivot irrigation machine shall be located at the point of connection of electrical power to the machine or shall be visible and not more than 50 feet from the machine.

(ii) The disconnecting means shall be readily accessible and capable of being locked in the open position.

(iii) A disconnecting means shall be provided for each motor and controller.

(10) Swimming pools, fountains, and similar installations. This subsection applies to electric wiring for and equipment in or adjacent to all swimming, wading, therapeutic, and decorative pools and fountains; hydro-massage bathtubs, whether permanently installed or storable; and metallic auxiliary equipment, such as pumps, filters, and similar equipment. Therapeutic pools in health care facilities are exempt from these provisions.

(a) Receptacles.

(i) A single receptacle of the locking and grounding type that provides power for a permanently installed swimming pool recirculating pump motor may be located not less than 5 feet from the inside walls of a pool. All other receptacles on the property shall be located at least 10 feet from the inside walls of a pool.

(ii) Receptacles that are located within 15 feet, or 20 feet if the installation was built after August 13, 2007, of the inside walls of the pool shall be protected by ground-fault circuit interrupters.

(iii) Where a pool is installed permanently at a dwelling unit, at least one 125-volt, 15- or 20-ampere receptacle on a general-purpose branch circuit shall be located a minimum of 10 feet and not more than 20 feet from the inside wall of the pool. This receptacle shall be located not more than 6 feet 6 inches above the floor, platform, or grade level serving the pool.

Note: In determining these dimensions, the distance to be measured is the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, or ceiling of a building or other effective permanent barrier.

(b) Lighting fixtures, lighting outlets, and ceiling suspended (paddle) fans.

(i) In outdoor pool areas, lighting fixtures, lighting outlets, and ceiling-suspended (paddle) fans may not be installed over the pool or over the area extending 5 feet horizontally from the inside walls of a pool unless no part of the lighting fixture of a ceiling-suspended (paddle) fan is less than 12 feet above the maximum water level. However, a lighting fixture or lighting outlet that was installed before April 16, 1981, may be located less than 5 feet measured horizontally from the inside walls of a pool if it is at least 5 feet above the surface of the maximum water level and is rigidly attached to the existing structure. It shall also be protected by a ground-fault circuit interrupter installed in the branch circuit supplying the fixture.

(ii) Lighting fixtures and lighting outlets installed in the area extending between 5 feet and 10 feet horizontally from the inside walls of a pool shall be protected by a ground-fault circuit interrupter unless installed 5 feet above the maximum water level and rigidly attached to the structure adjacent to or enclosing the pool.

(c) Cord- and plug-connected equipment. Flexible cords used with the following equipment may not exceed 3 feet in length and shall have a copper equipment grounding conductor with a grounding-type attachment plug:

(i) Cord- and plug-connected lighting fixtures installed within 16 feet of the water surface of permanently installed pools; and

(ii) Other cord- and plug-connected, fixed or stationary equipment used with permanently installed pools.

(d) Underwater equipment.

(i) A ground-fault circuit interrupter shall be installed in the branch circuit supplying underwater fixtures operating at more than 15 volts. Equipment installed underwater shall be identified

for the purpose.

(ii) No underwater lighting fixtures may be installed for operation at over 150 volts between conductors.

(iii) A lighting fixture facing upward shall have the lens adequately guarded to prevent contact by any person.

(e) Fountains. All electric equipment, including power supply cords, operating at more than 15 volts and used with fountains shall be protected by ground-fault circuit interrupters.

(11) Carnivals, circuses, fairs, and similar events. This subsection covers the installation of portable wiring and equipment, including wiring in or on all structures, for carnivals, circuses, exhibitions, fairs, traveling attractions, and similar events.

(a) Protection of electric equipment. Electric equipment and wiring methods in or on rides, concessions, or other units shall be provided with mechanical protection where such equipment or wiring methods are subject to physical damage.

(b) Installation.

(i) Services shall be installed in accordance with applicable requirements of this part, and, in addition, shall comply with the following:

(A) Service equipment may not be installed in a location that is accessible to unqualified persons, unless the equipment is lockable; and

(B) Service equipment shall be mounted on solid backing and installed so as to be protected from the weather, unless the equipment is of weatherproof construction.

(ii) Amusement rides and amusement attractions shall be maintained not less than 15 feet in any direction from overhead conductors operating at 600 volts or less, except for the conductors supplying the amusement ride or attraction. Amusement rides or attractions may not be located under or within 15 feet horizontally of conductors operating in excess of 600 volts.

(iii) Flexible cords and cables shall be listed for extra-hard usage. When used outdoors, flexible cords and cables shall also be listed for wet locations and shall be sunlight resistant.

(iv) Single conductor cable shall be size No. 2 or larger.

(v) Open conductors are prohibited except as part of a listed assembly or festoon lighting installed in accordance with WAC 296-24-95705(3).

(vi) Flexible cords and cables shall be continuous without splice or tap between boxes or fittings. Cord connectors may not be laid on the ground unless listed for wet locations. Connectors and cable connections may not be placed in audience traffic paths or within areas accessible to the public unless guarded.

(vii) Wiring for an amusement ride, attraction, tent, or similar structure may not be supported by another ride or structure unless specifically identified for the purpose.

(viii) Flexible cords and cables run on the ground, where accessible to the public, shall be covered with approved nonconductive mats. Cables and mats shall be arranged so as not to present a tripping hazard.

(ix) A box or fitting shall be installed at each connection

point, outlet, switch point, or junction point.

(c) Inside tents and concessions. Electrical wiring for temporary lighting, where installed inside of tents and concessions, shall be securely installed, and, where subject to physical damage, shall be provided with mechanical protection. All temporary lamps for general illumination shall be protected from accidental breakage by a suitable fixture or lampholder with a guard.

(d) Portable distribution and termination boxes. Employers may only use portable distribution and termination boxes that meet the following requirements:

(i) Boxes shall be designed so that no live parts are exposed to accidental contact. Where installed outdoors, the box shall be of weatherproof construction and mounted so that the bottom of the enclosure is not less than 6 inches above the ground;

(ii) Busbars shall have an ampere rating not less than the overcurrent device supplying the feeder supplying the box. Busbar connectors shall be provided where conductors terminate directly on busbars;

(iii) Receptacles shall have overcurrent protection installed within the box. The overcurrent protection may not exceed the ampere rating of the receptacle, except as permitted in WAC 296-24-95707 (10)(d) for motor loads;

(iv) Where single-pole connectors are used, they shall comply with the following:

(A) Where AC single-pole portable cable connectors are used, they shall be listed and of the locking type. Where paralleled sets of current-carrying single-pole separable connectors are provided as input devices, they shall be prominently labeled with a warning indicating the presence of internal parallel connections. The use of single-pole separable connectors shall comply with at least one of the following conditions:

(I) Connection and disconnection of connectors are only possible where the supply connectors are interlocked to the source and it is not possible to connect or disconnect connectors when the supply is energized; or

(II) Line connectors are of the listed sequential-interlocking type so that load connectors are connected in the following sequence:

- Equipment grounding conductor connection;
- Grounded circuit-conductor connection, if provided; and
- Ungrounded conductor connection; and so that disconnection is in the reverse order; or

(III) A caution notice is provided adjacent to the line connectors indicating that plug connection must be in the following sequence:

- Equipment grounding conductor connection;
- Grounded circuit-conductor connection, if provided; and
- Ungrounded conductor connection; and indicating that disconnection is in the reverse order; and

(B) Single-pole separable connectors used in portable professional motion picture and television equipment may be interchangeable for AC or DC use or for different current ratings

on the same premises only if they are listed for AC/DC use and marked to identify the system to which they are connected;

(v) Overcurrent protection of equipment and conductors shall be provided; and

(vi) The following equipment connected to the same source shall be bonded:

(A) Metal raceways and metal sheathed cable;

(B) Metal enclosures of electrical equipment; and

(C) Metal frames and metal parts of rides, concessions, trailers, trucks, or other equipment that contain or support electrical equipment.

(e) Disconnecting means.

(i) Each ride and concession shall be provided with a fused disconnect switch or circuit breaker located within sight and within 6 feet of the operator's station.

(ii) The disconnecting means shall be readily accessible to the operator, including when the ride is in operation.

(iii) Where accessible to unqualified persons, the enclosure for the switch or circuit breaker shall be of the lockable type.

(iv) A shunt trip device that opens the fused disconnect or circuit breaker when a switch located in the ride operator's console is closed is a permissible method of opening the circuit.

(12) Safety procedure and protective equipment required for exposure to movie theater Xenon bulbs. Exposure also includes opening of the lamphouse where the bulb is installed. The following are minimum requirements for theater personnel or others who install, change, or dispose of Xenon bulbs and are exposed to potential explosion hazard:

(a) All bulbs, new, used or subject to future disposal, must be stored in the protective jacket provided until time of use;

(b) Protective equipment shall be furnished at no cost to the employee and the use shall be strictly enforced for any exposed employee. Basic safety equipment required is:

(i) Full protective face shield with crown protector;

(ii) Safety glasses for use under face shield (to meet required impact resistance test of ANSI Z87.1);

(iii) Impact resistant, long-sleeved jacket of a length adequate to protect vital organs; and

(iv) Impact resistant gloves.

(c) A bulb subject to disposal should be removed with the regular, proper precautions, carefully placed in its protective jacket or cover and deliberately broken by dropping from a sufficient height. An unbroken bulb must never be disposed of as regular garbage or trash.

(d) Bulbs must be handled only at room temperature. If they have been in operation, adequate time (at least ten minutes) must be allowed for the bulb to cool to room temperature before handling.

NEW SECTION

WAC 296-24-95711 Hazardous (classified) locations. (1)

Scope.

(a) Applicability. This section covers the requirements for electric equipment and wiring in locations that are classified depending on the properties of the flammable vapors, liquids or gases, or combustible dusts or fibers that may be present therein and the likelihood that a flammable or combustible concentration or quantity is present. Hazardous (classified) locations may be found in occupancies such as, but not limited to, the following: Aircraft hangars, gasoline dispensing and service stations, bulk storage plants for gasoline or other volatile flammable liquids, paint-finishing process plants, health care facilities, agricultural or other facilities where excessive combustible dusts may be present, marinas, boat yards, and petroleum and chemical processing plants. Each room, section or area shall be considered individually in determining its classification.

(b) Classifications.

(i) These hazardous (classified) locations are assigned the following designations:

- (A) Class I, Division 1;
- (B) Class I, Division 2;
- (C) Class I, Zone 0;
- (D) Class I, Zone 1;
- (E) Class I, Zone 2;
- (F) Class II, Division 1;
- (G) Class II, Division 2;
- (H) Class III, Division 1;
- (I) Class III, Division 2.

(ii) For definitions of these locations, see WAC 296-24-990.

(c) Other sections of this part. All applicable requirements in this part apply to hazardous (classified) locations unless modified by provisions of this section.

(d) Division and zone classification. In Class I locations, an installation must be classified as using the division classification system meeting subsections (3) through (6) of this section or using the zone classification system meeting subsection (7) of this section. In Class II and Class III locations, an installation must be classified using the division classification system meeting subsections (3) through (6) of this section.

(2) Documentation. All areas designated as hazardous (classified) locations under the class and zone system and areas designated under the class and division system established after August 13, 2007, shall be properly documented. This documentation shall be available to those authorized to design, install, inspect, maintain, or operate electric equipment at the location.

(3) Electrical installations. Equipment, wiring methods, and installations of equipment in hazardous (classified) locations shall be intrinsically safe, approved for the hazardous (classified) location, or safe for the hazardous (classified) location. Requirements for each of these options are as follows:

(a) Intrinsically safe. Equipment and associated wiring

approved as intrinsically safe is permitted in any hazardous (classified) location for which it is approved;

(b) Approved for the hazardous (classified) location.

(i) Equipment shall be approved not only for the class of location, but also for the ignitable or combustible properties of the specific gas, vapor, dust, or fiber that will be present.

Note: NFPA 70, the National Electrical Code, lists or defines hazardous gases, vapors, and dusts by "Groups" characterized by their ignitable or combustible properties.

(ii) Equipment shall be marked to show the class, group, and operating temperature or temperature range, based on operation in a 40 degree C ambient, for which it is approved. The temperature marking may not exceed the ignition temperature of the specific gas or vapor to be encountered. However, the following provisions modify this marking requirement for specific equipment:

(A) Equipment of the nonheat-producing type, such as junction boxes, conduit, and fittings, and equipment of the heat-producing type having a maximum temperature not more than 100°C (212°F) need not have a marked operating temperature or temperature range;

(B) Fixed lighting fixtures marked for use in Class I, Division 2 or Class II, Division 2 locations only need not be marked to indicate the group;

(C) Fixed general-purpose equipment in Class I locations, other than lighting fixtures, that is acceptable for use in Class I, Division 2 locations need not be marked with the class, group, division, or operating temperature;

(D) Fixed dust-tight equipment, other than lighting fixtures, that is acceptable for use in Class II, Division 2 and Class III locations need not be marked with the class, group, division, or operating temperature; and

(E) Electric equipment suitable for ambient temperatures exceeding 40°C (104°F) shall be marked with both the maximum ambient temperature and the operating temperature or temperature range at that ambient temperature; and

(c) Safe for the hazardous (classified) location. Equipment that is safe for the location shall be of a type and design that the employer demonstrates will provide protection from the hazards arising from the combustibility and flammability of vapors, liquids, gases, dusts, or fibers involved.

Note: The National Electrical Code, NFPA 70, contains guidelines for determining the type and design of equipment and installations that will meet this requirement. Those guidelines address electric wiring, equipment, and systems installed in hazardous (classified) locations and contain specific provisions for the following: Wiring methods, wiring connections; conductor insulation, flexible cords, sealing and drainage, transformers, capacitors, switches, circuit breakers, fuses, motor controllers, receptacles, attachment plugs, meters, relays, instruments, resistors, generators, motors, lighting fixtures, storage battery charging equipment, electric cranes, electric hoists and similar equipment, utilization equipment, signaling systems, alarm systems, remote control systems, local loud speaker and communication systems, ventilation piping, live parts, lightning surge protection, and grounding.

(4) Conduits. All conduits shall be threaded and shall be made wrench-tight. Where it is impractical to make a threaded joint tight, a bonding jumper shall be utilized.

(5) Equipment in Division 2 locations. Equipment that has been approved for a Division 1 location may be installed in a Division 2 location of the same class and group. General-purpose equipment or equipment in general-purpose enclosures may be

installed in Division 2 locations if the employer can demonstrate that the equipment does not constitute a source of ignition under normal operating conditions.

(6) Protection techniques. The following are acceptable protection techniques for electric and electronic equipment in hazardous (classified) locations:

(a) Explosionproof apparatus. This protection technique is permitted for equipment in the Class I, Division 1 and 2 locations for which it is approved.

(b) Dust ignitionproof. This protection technique is permitted for equipment in the Class II, Division 1 and 2 locations for which it is approved.

(c) Dust-tight. This protection technique is permitted for equipment in the Class II, Division 2 and Class III locations for which it is approved.

(d) Purged and pressurized. This protection technique is permitted for equipment in any hazardous (classified) location for which it is approved.

(e) Nonincendive circuit. This protection technique is permitted for equipment in Class I, Division 2; Class II, Division 2; or Class III, Division 1 or 2 locations.

(f) Nonincendive equipment. This protection technique is permitted for equipment in Class I, Division 2; Class II, Division 2; or Class III, Division 1 or 2 locations.

(g) Nonincendive component. This protection technique is permitted for equipment in Class I, Division 2; Class II, Division 2; or Class III, Division 1 or 2 locations.

(h) Oil immersion. This protection technique is permitted for current-interrupting contacts in Class I, Division 2 locations as described in this part.

(i) Hermetically sealed. This protection technique is permitted for equipment in Class I, Division 2; Class II, Division 2; and Class III, Division 1 or 2 locations.

(j) Other protection techniques. Any other protection technique that meets subsection (3) of this section is acceptable in any hazardous (classified) location.

(7) Class I, Zone 0, 1, and 2 locations.

(a) Scope. Employers may use the zone classification system as an alternative to the division classification system for electric and electronic equipment and wiring for all voltage in Class I, Zone 0, Zone 1, and Zone 2 hazardous (classified) locations where fire or explosion hazards may exist due to flammable gases, vapors, or liquids.

(b) Location and general requirements.

(i) Locations shall be classified depending on the properties of the flammable vapors, liquids, or gases that may be present and the likelihood that a flammable or combustible concentration or quantity is present. Where pyrophoric materials are the only materials used or handled, these locations need not be classified.

(ii) Each room, section, or area shall be considered individually in determining its classification.

(iii) All threaded conduit shall be threaded with an NPT (National (American) Standard Pipe Taper) standard conduit cutting

die that provides 3/4 inch taper per foot. The conduit shall be made wrench tight to prevent sparking when fault current flows through the conduit system and to ensure the explosion proof or flameproof integrity of the conduit system where applicable.

(iv) Equipment provided with threaded entries for field wiring connection shall be installed in accordance with subsection (7)(b)(iv)(A) or (B) of this section.

(A) For equipment provided with threaded entries for NPT threaded conduit or fittings, listed conduit, conduit fittings, or cable fittings shall be used.

(B) For equipment with metric threaded entries, such entries shall be identified as being metric, or listed adaptors to permit connection to conduit of NPT-threaded fittings shall be provided with the equipment. Adapters shall be used for connection to conduit or NPT-threaded fittings.

(c) Protection techniques. One or more of the following protection techniques shall be used for electric and electronic equipment in hazardous (classified) locations classified under the zone classification system.

(i) Flameproof "d"--This protection technique is permitted for equipment in the Class I, Zone 1 locations for which it is approved.

(ii) Purged and pressurized--This protection technique is permitted for equipment in the Class I, Zone 1 or Zone 2 locations for which it is approved.

(iii) Intrinsic safety--This protection technique is permitted for equipment in the Class I, Zone 0 or Zone 1 locations for which it is approved.

(iv) Type of protection "n"--This protection technique is permitted for equipment in the Class I, Zone 2 locations for which it is approved. Type of protection "n" is further subdivided into nA, nC, and nR.

(v) Oil immersion "o"--This protection technique is permitted for equipment in the Class I, Zone 1 locations for which it is approved.

(vi) Increased safety "e"--This protection technique is permitted for equipment in the Class I, Zone 1 locations for which it is approved.

(vii) Encapsulation "m"--This protection technique is permitted for equipment in the Class I, Zone 1 locations for which it is approved.

(viii) Powder Filling "q"--This protection technique is permitted for equipment in the Class I, Zone 1 locations for which it is approved.

(d) Special precaution. This subsection requires equipment construction and installation that will ensure safe performance under conditions of proper use and maintenance.

(i) Classification of areas and selection of equipment and wiring methods shall be under the supervision of a qualified registered professional engineer.

(ii) In instances of areas within the same facility classified separately, Class I, Zone 2 locations may abut, but not overlap, Class I, Division 2 locations. Class I, Zone 0 or Zone 1 locations

may not abut Class I, Division 1 or Division 2 locations.

(iii) A Class I, Division 1 or Division 2 location may be reclassified as a Class I, Zone 0, Zone 1, or Zone 2 location only if all of the space that is classified because of a single flammable gas or vapor source is reclassified.

Note: Low ambient conditions require special consideration. Electric equipment depending on the protection techniques described by (c)(i) of this subsection may not be suitable for use at temperatures lower than -20 °C (-4 °F) unless they are approved for use at lower temperatures. However, at low ambient temperatures, flammable concentrations of vapors may not exist in a location classified Class I, Zone 0, 1, or 2 at normal ambient temperature.

(e) Listing and marking.

(i) Equipment that is listed for a Zone 0 location may be installed in a Zone 1 or Zone 2 location of the same gas or vapor. Equipment that is listed for a Zone 1 location may be installed in a Zone 2 location of the same gas or vapor.

(ii) Equipment shall be marked in accordance with (e)(ii)(A) and (B) of this subsection, except as provided in (e)(ii)(C) of this subsection.

(A) Equipment approved for Class I, Division 1 or Class 1, Division 2 shall, in addition to being marked in accordance with subsection (3)(b)(ii) of this section, be marked with the following:

- (I) Class I, Zone 1 or Class I, Zone 2 (as applicable);
- (II) Applicable gas classification groups; and
- (III) Temperature classification; or

(B) Equipment meeting one or more of the protection techniques described in (c) of this subsection shall be marked with the following in the order shown:

- (I) Class, except for intrinsically safe apparatus;
- (II) Zone, except for intrinsically safe apparatus;
- (III) Symbol "AEx;"
- (IV) Protection techniques;
- (V) Applicable gas classification groups; and

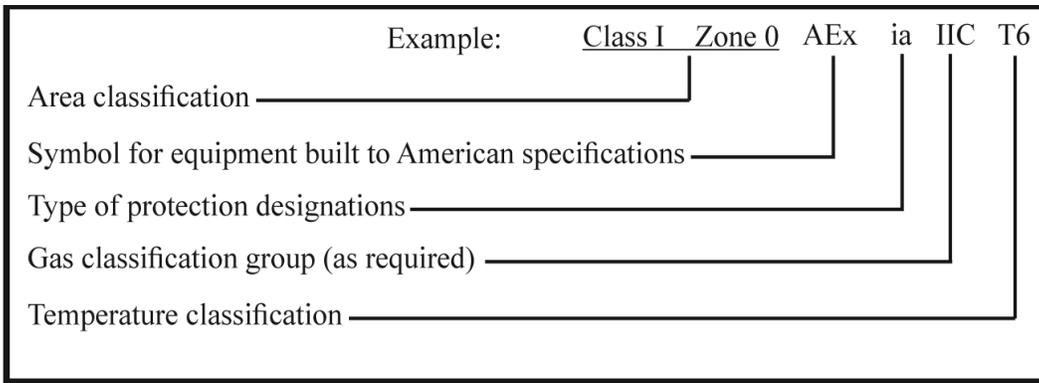
(VI) Temperature classification, except for intrinsically safe apparatus.

Note: An example of such a required marking is "Class I, Zone 0, AEx ia IIC T6." See Figure S-1 for an explanation of this marking.

(C) Equipment that the employer demonstrates will provide protection from the hazards arising from the flammability of the gas or vapor and the zone of location involved and will be recognized as providing such protection by employees need not be marked.

Note: The National Electrical Code, NFPA 70, contains guidelines for determining the type and design of equipment and installations that will meet this provision.

Figure S-1--Example Marking for Class I, Zone 0, AEx ia IIC T6



NEW SECTION

WAC 296-24-95713 Special systems. (1) Systems over 600 volts, nominal. This subsection covers the general requirements for all circuits and equipment operated at over 600 volts.

(a) Aboveground wiring methods.

(i) Aboveground conductors shall be installed in rigid metal conduit, in intermediate metal conduit, in electrical metallic tubing, in rigid nonmetallic conduit, in cable trays, as busways, as cablebus, in other identified raceways, or as open runs of metal-clad cable suitable for the use and purpose. In locations accessible to qualified persons only, open runs of Type MV cables, bare conductors, and bare busbars are also permitted. Busbars shall be either copper or aluminum. Open runs of insulated wires and cables having a bare lead sheath or a braided outer covering shall be supported in a manner designed to prevent physical damage to the braid or sheath.

(ii) Conductors emerging from the ground shall be enclosed in approved raceways.

(b) Braid-covered insulated conductors--Open installations. The braid on open runs of braid-covered insulated conductors shall be flame retardant or shall have a flame-retardant saturant applied after installation. This treated braid covering shall be stripped back a safe distance at conductor terminals, according to the operating voltage.

(c) Insulation shielding.

(i) Metallic and semiconductor insulation shielding components of shielded cables shall be removed for a distance dependent on the circuit voltage and insulation. Stress reduction means shall be provided at all terminations of factory-applied shielding.

(ii) Metallic shielding components such as tapes, wires, or braids, or combinations thereof, and their associated conducting and semiconducting components shall be grounded.

(d) Moisture or mechanical protection for metal-sheathed

cables. Where cable conductors emerge from a metal sheath and where protection against moisture or physical damage is necessary, the insulation of the conductors shall be protected by a cable sheath terminating device.

(e) Interrupting and isolating devices.

(i) Circuit breaker installations located indoors shall consist of metal-enclosed units or fire-resistant cell-mounted units. In locations accessible only to qualified employees, open mounting of circuit breakers is permitted. A means of indicating the open and closed position of circuit breakers shall be provided.

(ii) Where fuses are used to protect conductors and equipment, a fuse shall be placed in each ungrounded conductor. Two power fuses may be used in parallel to protect the same load, if both fuses have identical ratings, and if both fuses are installed in an identified common mounting with electrical connections that will divide the current equally. Power fuses of the vented type may not be used indoors, underground, or in metal enclosures unless identified for the use.

(iii) Fused cutouts installed in buildings or transformer vaults shall be of a type identified for the purpose. Distribution cutouts may not be used indoors, underground, or in metal enclosures. They shall be readily accessible for fuse replacement.

(iv) Where fused cutouts are not suitable to interrupt the circuit manually while carrying full load, an approved means shall be installed to interrupt the entire load. Unless the fused cutouts are interlocked with the switch to prevent opening of the cutouts under load, a conspicuous sign shall be placed at such cutouts reading: "WARNING--DO NOT OPERATE UNDER LOAD."

(v) Suitable barriers or enclosures shall be provided to prevent contact with nonshielded cables or energized parts of oil-filled cutouts.

(vi) Load interrupter switches may be used only if suitable fuses or circuits are used in conjunction with these devices to interrupt fault currents.

(A) Where these devices are used in combination, they shall be coordinated electrically so that they will safely withstand the effects of closing, carrying, or interrupting all possible currents up to the assigned maximum short-circuit rating.

(B) Where more than one switch is installed with interconnected load terminals to provide for alternate connection to different supply conductors, each switch shall be provided with a conspicuous sign reading: "WARNING--SWITCH MAY BE ENERGIZED BY BACKFEED."

(vii) A means (for example, a fuseholder and fuse designed for the purpose) shall be provided to completely isolate equipment for inspection and repairs. Isolating means that they are not designed to interrupt the load current of the circuit and shall be either interlocked with an approved circuit interrupter or provided with a sign warning against opening them under load.

(f) Mobile and portable equipment.

(i) A metallic enclosure shall be provided on the mobile machine for enclosing the terminals of the power cable. The enclosure shall include provisions for a solid connection for the

grounding terminal to effectively ground the machine frame. The method of cable termination used shall prevent any strain or pull on the cable from stressing the electrical connections. The enclosure shall have provision for locking so that only authorized qualified persons may open it and shall be marked with a sign warning of the presence of energized parts.

(ii) All energized switching and control parts shall be enclosed in effectively grounded metal cabinets or enclosures. Circuit breakers and protective equipment shall have the operating means projecting through the metal cabinet or enclosure so these units can be reset without locked doors being opened. Enclosures and metal cabinets shall be locked so that only authorized qualified persons have access and shall be marked with a sign warning of the presence of energized parts. Collector ring assemblies on revolving-type machines (shovels, draglines, etc.) shall be guarded.

(g) Tunnel installations. This subsection applies to installation and use of high-voltage power distribution and utilization equipment that is portable or mobile, such as substations, trailers, cars, mobile shovels, draglines, hoists, drills, dredges, compressors, pumps, conveyors, and underground excavators.

(i) Conductors in tunnels shall be installed in one or more of the following:

- (A) Metal conduit or other metal raceway;
- (B) Type MC cable; or
- (C) Other approved multiconductor cable.

(ii) Multiconductor portable cable may supply mobile equipment.

(iii) Conductors and cables shall also be so located or guarded as to protect them from physical damage. An equipment grounding conductor shall be run with circuit conductors inside the metal raceway or inside the multiconductor cable jacket. The equipment grounding conductor may be insulated or bare.

(iv) Bare terminals of transformers, switches, motor controllers, and other equipment shall be enclosed to prevent accidental contact with energized parts.

(v) Enclosures for use in tunnels shall be drip-proof, weatherproof, or submersible as required by the environmental conditions.

(vi) Switch or contactor enclosures may not be used as junction boxes or raceways for conductors feeding through or tapping off to other switches, unless special designs are used to provide adequate space for this purpose.

(vii) A disconnecting means that simultaneously opens all ungrounded conductors shall be installed at each transformer or motor location.

(viii) All nonenergized metal parts of electric equipment and metal raceways and cable sheaths shall be effectively grounded and bonded to all metal pipes and rails at the portal and at intervals not exceeding 1000 feet throughout the tunnel.

(2) Emergency power systems. This subsection applies to circuits, systems, and equipment intended to supply power for

illumination and special loads in the event of failure of the normal supply.

(a) Wiring methods. Emergency circuit wiring shall be kept entirely independent of all other wiring and equipment and may not enter the same raceway, cable, box, or cabinet or other wiring except either where common circuit elements suitable for the purpose are required, or for transferring power from the normal to the emergency source.

(b) Emergency illumination. Emergency illumination shall include all required means of egress lighting, illuminated exit signs, and all other lights necessary to provide illumination. Where emergency lighting is necessary, the system shall be so arranged that the failure of any individual lighting element, such as the burning out of a light bulb, cannot leave any space in total darkness.

(c) Signs.

(i) A sign shall be placed at the service entrance equipment indicating the type and location of on-site emergency power sources. However, a sign is not required for individual unit equipment.

(ii) Where the grounded circuit conductor connected to the emergency source is connected to a grounding electrode conductor at a location remote from the emergency source, there shall be a sign at the grounding location that shall identify all emergency and normal sources connected at that location.

(3) Class 1, Class 2, and Class 3 remote control, signaling, and power-limited circuits.

(a) Classification. Class 1, Class 2, and Class 3 remote control, signaling, or power-limited circuits are characterized by their usage and electrical power limitation that differentiates them from light and power circuits. These circuits are classified in accordance with their respective voltage and power limitations as summarized in (a)(i) through (iii) of this subsection.

(i) A Class 1 power-limited circuit shall be supplied from a source having a rated output of not more than 30 volts and 1000 volt-amperes.

(ii) A Class 1 remote control circuit or a Class 1 signaling circuit shall have a voltage not exceeding 600 volts; however, the power output of the source need not be limited.

(iii) The power source for a Class 2 or Class 3 circuit shall be listed equipment marked as a Class 2 or Class 3 power source, except as follows:

(A) Thermocouples do not require listing as a Class 2 power source; and

(B) A dry cell battery is considered an inherently limited Class 2 power source, provided the voltage is 30 volts or less and the capacity is less than or equal to that available from series-connected No. 6 carbon zinc cells.

(b) Marking. A Class 2 or Class 3 power supply unit shall be durably marked where plainly visible to indicate the class of supply and its electrical rating.

(c) Separation from conductors of other circuits. Cables and conductors of Class 2 and Class 3 circuits may not be placed in any

cable, cable tray, compartment, enclosure, manhole, outlet box, device box, raceway, or similar fitting with conductors of electric light, power, Class 1, nonpower-limited fire alarm circuits, and medium power network-powered broadband communications cables unless a barrier or other equivalent form of protection against contact is employed.

(4) Fire alarm systems.

(a) Classifications. Fire alarm circuits shall be classified either as nonpower limited or power limited.

(b) Power sources. The power sources for use with fire alarm circuits shall be either power limited or nonpower limited as follows:

(i) The power source of nonpower-limited fire alarm (NPLFA) circuits shall have an output voltage of not more than 600 volts, nominal; and

(ii) The power source for a power-limited fire alarm (PLFA) circuit shall be listed equipment marked as a PLFA power source.

(c) Separation from conductors of other circuits.

(i) Nonpower-limited fire alarm circuits and Class 1 circuits may occupy the same enclosure, cable, or raceway provided all conductors are insulated for maximum voltage of any conductor within the enclosure, cable, or raceway. Power supply and fire alarm circuit conductors are permitted in the same enclosure, cable, or raceway only if connected to the same equipment.

(ii) Power-limited circuit cables and conductors may not be placed in any cable, cable tray, compartment, enclosure, outlet box, raceway, or similar fitting with conductors of electric light, power, Class 1, nonpower-limited fire alarm circuit conductors, or medium power network-powered broadband communications circuits.

(iii) Power-limited fire alarm circuit conductors shall be separated at least 2 inches from conductors of any electric light, power, Class 1, nonpower-limited fire alarm, or medium power network-powered broadband communications circuits unless a special and equally protective method of conductor separation is employed.

(iv) Conductors of one or more Class 2 circuits are permitted within the same cable, enclosure, or raceway with conductors of power-limited fire alarm circuits provided that the insulation of Class 2 circuit conductors in the cable, enclosure, or raceway is at least that needed for the power-limited fire alarm circuits.

(d) Identification. Fire alarm circuits shall be identified at terminal and junction locations in a manner that will prevent unintentional interference with the signaling circuit during testing and servicing. Power-limited fire alarm circuits shall be durably marked as such where plainly visible at terminations.

(5) Communications systems. This subsection applies to central-station-connected and noncentral-station-connected telephone circuits, radio and television receiving and transmitting equipment, including community antenna television and radio distribution systems, telegraph, district messenger, and outside wiring for fire and burglar alarm, and similar central station systems. These installations need not comply with the provisions of WAC 296-24-95703 through 296-24-95713(4), except for WAC 296-24-95705 (3)(a) and 296-24-95711.

(a) Protective devices.

(i) A listed primary protector shall be provided on each circuit run partly or entirely in aerial wire or aerial cable not confined within a block.

(ii) A listed primary protector shall also be provided on each aerial or underground circuit when the location of the circuit within the block containing the building served allows the circuit to be exposed to accidental contact with electric light or power conductors operating at over 300 volts to ground.

(iii) In addition, where there exists a lightning exposure, each interbuilding circuit on premises shall be protected by a listed primary protector at each end of the interbuilding circuit.

(b) Conductor location.

(i) Lead-in or aerial-drop cables from a pole or other support, including the point of initial attachment to a building or structure, shall be kept away from electric light, power, Class 1, or nonpower-limited fire alarm circuit conductors so as to avoid the possibility of accidental contact.

(ii) A separation of at least 6 feet shall be maintained between communications wires and cables on buildings and lightning conductors.

(iii) Where communications wires and cables and electric light or power conductors are supported by the same pole or run parallel to each other in-span, the following conditions shall be met:

(A) Where practicable, communication wires and cables on poles shall be located below the electric light or power conductors; and

(B) Communications wires and cables may not be attached to a crossarm that carries electric light or power conductors.

(iv) Indoor communications wires and cables shall be separated at least 2 inches from conductors of any electric light, power, Class 1, nonpower-limited fire alarm, or medium power network-powered broadband communications circuits, unless a special and equally protective method of conductor separation, approved for the purpose, is employed.

(c) Equipment location. Outdoor metal structures supporting antennas, as well as self-supporting antennas such as vertical rods or dipole structures, shall be located as far away from overhead conductors of electric light and power circuits of over 150 volts to ground as necessary to prevent the antenna or structure from falling into or making accidental contact with such circuits.

(d) Grounding.

(i) If exposed to contact with electric light and power conductors, the metal sheath of aerial cables entering buildings shall be grounded or shall be interrupted close to the entrance to the building by an insulating joint or equivalent device. Where protective devices are used, they shall be grounded in an approved manner.

(ii) Masts and metal structures supporting antennas shall be permanently and effectively grounded without splice or connection in the grounding conductor.

(iii) Transmitters shall be enclosed in a metal frame or grill or separated from the operating space by a barrier, all metallic parts of which are effectively connected to ground. All external

metal handles and controls accessible to the operating personnel shall be effectively grounded. Unpowered equipment and enclosures are considered to be grounded where connected to an attached coaxial cable with an effectively grounded metallic shield.

(6) Solar photovoltaic systems. This subsection covers solar photovoltaic systems that can be interactive with other electric power production sources or can stand alone with or without electrical energy storage such as batteries. These systems may have AC or DC output for utilization.

(a) Conductors of different systems. Photovoltaic source circuits and photovoltaic output circuits may not be contained in the same raceway, cable tray, cable, outlet box, junction box, or similar fitting as feeders or branch circuits of other systems, unless the conductors of the different systems are separated by a partition or are connected together.

(b) Disconnecting means. Means shall be provided to disconnect all current-carrying conductors of a photovoltaic power source from all other conductors in a building or other structure. Where a circuit grounding connection is not designed to be automatically interrupted as part of the ground-fault protection system, a switch or circuit breaker used as disconnecting means may not have a pole in the grounded conductor.

(7) Integrated electrical systems.

(a) Scope. This subsection covers integrated electrical systems, other than unit equipment, in which orderly shutdown is necessary to ensure safe operation. An integrated electrical system as used in this section shall be a unitized segment of an industrial wiring system where all of the following conditions are met:

(i) The conditions of maintenance and supervision ensure that only qualified persons will service the system; and

(ii) Effective safeguards are established and maintained.

(b) Location of overcurrent devices in or on premises. Overcurrent devices that are critical to integrated electrical systems need not be readily accessible to employees as required by WAC 296-24-95705 (6)(a)(iv) if they are located with mounting heights to ensure security from operation by nonqualified persons.

NEW SECTION

WAC 296-24-95799 Appendices. Appendix A - Reference documents. The following references provide information which can be helpful in understanding and complying with the requirements contained in WAC 296-24-957 through 296-24-985.

ANSI/API RP 500-1998 (2002) Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I Division 1 and Division 2.
ANSI/API RP 505-1997 (2002) Recommended Practice for Classification

of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1 and Zone 2.

ANSI/ASME A17.1-2004 Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks.

ANSI/ASME B30.2-2005 Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist).

ANSI/ASME B30.3-2004 Construction Tower Cranes.

ANSI/ASME B30.4-2003 Portal, Tower, and Pedestal Cranes.

ANSI/ASME B30.5-2004 Mobile and Locomotive Cranes.

ANSI/ASME B30.6-2003 Derricks.

ANSI/ASME B30.7-2001 Base Mounted Drum Hoists.

ANSI/ASME B30.8-2004 Floating Cranes and Floating Derricks.

ANSI/ASME B30.11-2004 Monorails and Underhung Cranes.

ANSI/ASME B30.12-2001 Handling Loads Suspended from Rotorcraft.

ANSI/ASME B30.13-2003 Storage/Retrieval (S/R) Machines and Associated Equipment.

ANSI/ASME B30.16-2003 Overhead Hoists (Underhung).

ANSI/ASME B30.22-2005 Articulating Boom Cranes.

ANSI/ASSE Z244.1-2003 Control of Hazardous Energy Lockout/Tagout and Alternative Methods.

ANSI/ASSE Z490.1-2001 Criteria for Accepted Practices in Safety, Health, and Environmental Training.

ANSI/IEEE C2-2002 National Electrical Safety Code.

ANSI K61.1-1999 Safety Requirements for the Storage and Handling of Anhydrous Ammonia.

ANSI/UL 913-2003 Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations.

ASTM D3176-1989 (2002) Standard Practice for Ultimate Analysis of Coal and Coke.

ASTM D3180-1989 (2002) Standard Practice for Calculating Coal and Coke Analyses from as Determined to Different Bases.

NFPA 20-2003 Standard for the Installation of Stationary Pumps for Fire Protection.

NFPA 30-2003 Flammable and Combustible Liquids Code.

NFPA 32-2004 Standard for Drycleaning Plants.

NFPA 33-2003 Standard for Spray Application Using Flammable or Combustible Materials.

NFPA 34-2003 Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids.

NFPA 35-2005 Standard for the Manufacture of Organic Coatings.

NFPA 36-2004 Standard for Solvent Extraction Plants.

NFPA 40-2001 Standard for the Storage and Handling of Cellulose Nitrate Film.

NFPA 58-2004 Liquefied Petroleum Gas Code.

NFPA 59-2004 Utility LP-Gas Plant Code.

NFPA 70-2002 National Electrical Code (see also NFPA 70-2005).

NFPA 70E-2000 Standard for the Electrical Safety Requirements for Employee Workplaces (see also NFPA 70E-2004).

NFPA 77-2000 Recommended Practice on Static Electricity.

NFPA 80-1999 Standard for Fire Doors and Windows.

NFPA 88A-2002 Standard for Parking Structures.

NFPA 91-2004 Standard for Exhaust Systems for Air Conveying of

Vapors, Gases, Mists, and Noncombustible Particulate Solids.
NFPA 101-2006 Life Safety Code.
NFPA 496-2003 Standard for Purged and Pressurized Enclosures for
Electrical Equipment.
NFPA 497-2004 Recommended Practice for Classification of Flammable
Liquids, Gases, or Vapors and of Hazardous (Classified)
Locations for Electrical Installations in Chemical Process
Areas.
NFPA 505-2006 Fire Safety Standard for Powered Industrial Trucks
Including Type Designations, Areas of Use, Conversions,
Maintenance, and Operation.
NFPA 820-2003 Standard for Fire Protection in Wastewater Treatment
and Collection Facilities.
NMAB 353-1-1979 Matrix of Combustion-Relevant Properties and
Classification of Gases, Vapors, and Selected Solids.
NMAB 353-2-1979 Test Equipment for Use in Determining
Classifications of Combustible Dusts.
NMAB 353-3-1980 Classification of Combustible Dusts in Accordance
with the National Electrical Code.

NEW SECTION

WAC 296-24-990 Definitions. Definitions applicable to WAC
296-24-956 through 296-24-985. Unless the context indicates
otherwise, words used in this section shall have the meaning given.

Acceptable. An installation or equipment is acceptable to the
director of labor and industries, and approved within the meaning
of this section:

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

(b) 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 this section; or

(c) 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
director and his/her authorized representatives. Refer to federal
regulation 29 C.F.R. 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 of 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 authority enforcing this section. The authority enforcing this section is the director of labor and industries. The definition of "acceptable" indicates what is acceptable to the director and therefore approved within the meaning of this section.

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.

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."

Barrier. A physical obstruction that is intended to prevent contact with equipment or live parts or to prevent unauthorized access to a work area.

Bathroom. An area including a basin with one or more of the following: A toilet, a tub, or a shower.

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. The circuit conductors between the final overcurrent device protecting the circuit and the outlet(s).

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 cable tray system is 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. Cablebus is an approved assembly of insulated conductors with fittings and conductor terminations in a completely enclosed, ventilated, protective metal housing.

Cell line. An assembly of electrically interconnected electrolytic cells supplied by a source of direct current power.

Cell line attachments and auxiliary equipment. Cell line attachments and auxiliary equipment include, but are not limited to, auxiliary tanks, process piping, ductwork, structural supports, exposed cell line conductors, conduits and other raceways, pumps, positioning equipment, and cell cutout or bypass electrical devices. Auxiliary equipment also includes tools, welding machines, crucibles, and other portable equipment used for operation and maintenance within the electrolytic cell line working zone. In the cell line working zone, auxiliary equipment includes the exposed conductive surfaces of ungrounded cranes and crane-mounted cell-servicing equipment.

Center pivot irrigation machine. A center pivot irrigation machine is a multimotored 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.

(a) **(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.

(b) **(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:

(a) **Class I, Division 1.** A Class I, Division 1 location is a location:

(i) In which hazardous concentrations of flammable gases or vapors may exist under normal operating conditions; or

(ii) In which hazardous concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or

(iii) 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.

(b) **Class I, Division 2.** A Class I, Division 2 location is a location:

(i) 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

(ii) 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

(iii) 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.

(c) **Class I, Zone 0.** A Class I, Zone 0 location is a location in which one of the following conditions exists:

(i) Ignitable concentrations of flammable gases or vapors are present continuously; or

(ii) Ignitable concentrations of flammable gases or vapors are present for long periods of time.

Note to the definition of "Class I, Zone 0": As a guide in determining when flammable gases or vapors are present continuously or for long periods of time, refer to *Recommended Practice for Classification of Locations for Electrical Installations of Petroleum Facilities Classified as Class I, Zone 0, Zone 1 or Zone 2, API RP 505-1997; Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous Areas, IEC 79-10-1995; Area Classification Code for Petroleum Installations, Model Code--Part 15, Institute for Petroleum; and Electrical Apparatus for Explosive Gas Atmospheres, Classifications of Hazardous (Classified) Locations, ISA S12.24.01-1997.*

(d) **Class I, Zone 1.** A Class I, Zone 1 location is a location in which one of the following conditions exists:

(i) Ignitable concentrations of flammable gases or vapors are likely to exist under normal operating conditions; or

(ii) Ignitable concentrations of flammable gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or

(iii) Equipment is operated or processes are carried on of such a nature that equipment breakdown or faulty operations could result in the release of ignitable concentrations of flammable gases or vapors and also cause simultaneous failure of electric equipment in a manner that would cause the electric equipment to become a source of ignition; or

(iv) A location that is adjacent to a Class I, Zone 0 location from which ignitable concentrations of vapors could be communicated, unless communication is prevented by adequate positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.

(e) **Class I, Zone 2.** A Class I, Zone 2 location is a location in which one of the following conditions exists:

(i) Ignitable concentrations of flammable gases or vapors are not likely to occur in normal operation and if they do occur will exist only for a short period; or

(ii) Volatile flammable liquids, flammable gases, or flammable vapors are handled, processed, or used, but in which the liquids, gases, or vapors are normally confined within closed containers or

closed systems from which they can escape only as a result of accidental rupture or breakdown of the containers or system or as the result of the abnormal operation of the equipment with which the liquids or gases are handled, processed, or used; or

(iii) Ignitable concentrations of flammable gases or vapors normally are prevented by positive mechanical ventilation, but which may become hazardous as the result of failure or abnormal operation of the ventilation equipment; or

(iv) A location that is adjacent to a Class I, Zone 1 location, from which ignitable concentrations of flammable gases or vapors could 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.

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

(a) **Class II, Division 1.** A Class II, Division 1 location is a location:

(i) In which combustible dust is or may be in suspension in the air under normal operating conditions, in quantities sufficient to produce explosives or ignitable mixtures; or

(ii) 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 protection devices, or from other causes; or

(iii) In which combustible dusts of an electrically conductive nature may be present.

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 woodflour, 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.

(b) **Class II, Division 2.** A Class II, Division 2 location is a location in which:

(i) 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

(ii) 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:

(a) **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 cottonseed 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.

(b) **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.

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

Concealed. Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them. See "Accessible. (As applied to wiring methods.)"

Conductor.

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

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

(c) **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. (See "oven, wall-mounted.")

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.

Deenergized. Free from any electrical connection to a source of potential difference and from electrical charge; not having a potential difference from that of the earth.

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

Dielectric heating. Dielectric heating is the heating of a nominally insulating material due to its own dielectric losses when the materials are 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. Fixed, stationary, or portable self-contained, electrically illuminated utilization equipment with words or symbols designed to convey information or attract attention.

Electrolytic cell line working zone. The cell line working zone is the space envelope wherein operation or maintenance is normally performed on or in the vicinity of exposed energized surfaces of electrolytic cell lines or their attachments.

Electrolytic cells. A tank or vat in which electrochemical reactions are caused by applying energy for the purpose of refining or producing usable materials.

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.

Energized. Electrically connected to a source of potential difference.

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 purpose of WAC 296-24-95713(5), 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.

Fountain. Fountains, ornamental pools, display pools, and reflection pools.

Note to the definition of "fountain:" This definition does not include drinking fountains.

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 noncurrent-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 to the equipment grounding conductor and/or to the grounded conductor of the circuit at the service equipment or at the source of a separately derived system.

Ground-fault circuit-interrupter. A device whose function is to interrupt the electric circuit to the load when a fault current to ground exceeds some predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit.

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 WAC 296-24-95611(7), 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.

Identified (as applied to equipment). Approved as suitable for the specific purpose, function, use, environment, or application, where described in a particular requirement.

Note to the definition of "identified (as applied to equipment):" Some examples of ways to determine suitability of equipment for a specific purpose, environment, or application include investigations by a nationally recognized testing laboratory (through listing and labeling), inspection agency, or other organization recognized under the definition of "acceptable."

Induction heating. Induction heating is the heating of a nominally conductive material due to its own I²R losses when the material is placed in a varying electromagnetic field.

Insulated. Separated from other conducting surfaces by a dielectric (including air space) offering a high resistance to the passage of current.

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 its 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 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.

(a) **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 basements, some barns, and some cold-storage warehouses.

(b) **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.

(c) **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.

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 liquidtight and gastight continuous copper sheath.

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

Motor control center. An assembly of one or more enclosed sections having a common power bus and principally containing motor control units.

Nonmetallic-sheathed cable. Nonmetallic-sheathed cable is 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:

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

(b) **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 occur under oil.

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 or more heating elements, internal wiring, and built-in or separately mountable controls. (See "cooking unit, counter-mounted.")

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.

Overhaul. To perform a major replacement, modification, repair, or rehabilitation similar to that involved when a new building or facility is built, a new wing is added, or an entire floor is renovated.

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. One familiar with the construction and operation of the equipment and the hazards involved.

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 WAC 296-24-970 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 this part. Raceways may be of metal or insulating material, and the term includes rigid metal conduit, rigid nonmetallic conduit,

intermediate metal conduit, liquidtight 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:

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

(b) **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 they 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-resistant, flame-resistant, oil-resistant, corrosion-resistant, fungus-resistant, 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 fifteen feet and a maximum wall height of three feet and is so constructed that it may be readily disassembled for storage and reassembled to its original integrity.

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.

(a) **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.

(b) **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 part.

(c) **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.

(d) **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. Utilization equipment means equipment which utilizes electric energy for mechanical, chemical, heating, lighting, or similar useful purpose.

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

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°C (100°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 undergrounded 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, raintight, 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.

REPEALER

The following sections of the Washington Administrative Code are repealed:

WAC 296-24-956	Electrical.
WAC 296-24-95601	Definitions applicable to WAC 296-24-956 through 296-24-985.
WAC 296-24-95603	Electric utilization systems.
WAC 296-24-95605	General requirements.
WAC 296-24-95607	Wiring design and protection.
WAC 296-24-95609	Wiring methods, components, and equipment for general use.
WAC 296-24-95611	Specific purpose equipment and installations.
WAC 296-24-95613	Hazardous (classified) locations.
WAC 296-24-95615	Special systems.
WAC 296-24-95617	Reserved.
WAC 296-24-95699	Appendices.

AMENDATORY SECTION (Amending WSR 01-23-060, filed 11/20/01, effective 12/1/01)

WAC 296-800-280 Basic electrical rules. Summary. Your responsibility: To protect your employees from hazards when working with electrical equipment, tools, and appliances.

You must:

Inspect all electrical equipment your employees use to make sure the equipment is safe.

WAC 296-800-28005.

Make sure all electrical equipment is used for its approved or listed purpose.

WAC 296-800-28010.

Make sure electrical equipment used or located in wet or damp locations is designed for such use.

WAC 296-800-28015.

Make sure electrical equipment that is not marked by the manufacturer cannot be used.

WAC 296-800-28020.

Identify disconnecting means.

WAC 296-800-28022.

Maintain electrical fittings, boxes, cabinets, and outlets in good condition.

WAC 296-800-28025.

Maintain all flexible cords and cables in good condition and use safely.

WAC 296-800-28030.

Guard electrical equipment to prevent your employees from electrical hazards.

WAC 296-800-28035.

Make sure electrical equipment is effectively grounded.

WAC 296-800-28040.

Make sure electrical equipment has overcurrent protection.

WAC 296-800-28045.

Exemptions:

- These rules apply to all electrical equipment used in the workplace, except for:
 - Electrical installations and equipment on ships, watercraft, railway rolling stock, aircraft and all automotive vehicles other than mobile homes and recreational vehicles.
 - Electrical installations and equipment used to generate, transmit, transform or distribute power exclusively for operation of rolling stock.
 - Electrical installations of railways used exclusively for signaling and ~~((communicating with rolling stock))~~ communication purposes.
 - Installations underground in mines.
 - Installations of communication equipment under the exclusive control of communications utilities, located outdoors or ~~((inside))~~ in building((s)) spaces used ~~((and controlled))~~ exclusively ~~((by communication utilities))~~ for such installations.
 - Installations controlled and used exclusively by electric utilities for:
 - Communication or metering((:)) purposes; or
 - ~~((For))~~ ■ Generating, controlling, transforming, transmitting and distributing electric energy that are located:
 - ◆ In buildings used exclusively by the ~~((company located))~~ utility for such purposes; or
 - ◆ Outdoors on property owned or leased by the utility; or
 - ◆ On public highways, streets and roads; or

◆ Outdoors by established rights on private property.

- Note:**
- The introduction has important information about fire, building and electrical codes that may apply to you in addition to WISHA rules. See "How do the WISHA rules relate to fire, building and electrical codes" in the introduction section of this book.
 - These rules guide how electrical equipment is used and maintained in your workplace. They should not be used in place of your local electrical codes if you are installing electrical wiring, electrical circuits or electrical distribution equipment.
 - This rule applies to 600 volts or less. Requirements for specific equipment or special installation are found in chapter 296-24 WAC, Part L.

AMENDATORY SECTION (Amending WSR 01-23-060, filed 11/20/01, effective 12/1/01)

WAC 296-800-28005 Inspect all electrical equipment your employees use to make sure the equipment is safe. You must:

● Inspect electrical equipment to make sure there are no recognized hazards likely to cause ~~((your employees))~~ death or serious physical harm to employees. Determine the safety of the equipment by ~~((using))~~ considering the following ~~((list))~~:

Suitability for installation and use as evidenced by:

- ~~((Has been))~~ Approved or listed by a recognized testing laboratory, such as Underwriters Laboratories (UL) or other approving agency.

- ~~((Is approved,))~~ Labeled or listed ~~((as approved,))~~ for the purpose it is being used.

~~((Has strong and durable guards providing adequate protection including parts designed to enclose and protect other equipment.~~

~~- Is insulated.~~

~~- Will not overheat under conditions of use.~~

~~- Will not produce arcs during normal use.~~

~~- Is classified by:~~

◆ ~~Type~~

◆ ~~Size~~

◆ ~~Voltage~~

◆ ~~Current capacity~~

◆ ~~Specific use~~

◆ ~~Other factors))~~

- Mechanical strength and durability, including the adequacy of the protection provided by parts designed to enclose and protect other equipment.

- Wire-bending and connection space.

- Electrical insulation.

- Heating effects under all conditions of use.

- Arcing effects.

- Classification by type, size, voltage, current capacity, and specific use.

- Other factors that contribute to the practical safeguarding of persons using or likely to come in contact with the equipment.

AMENDATORY SECTION (Amending WSR 01-23-060, filed 11/20/01, effective 12/1/01)

WAC 296-800-28010 Make sure all electrical equipment is used for its approved or listed purpose.

- Definitions:**
- Electrical outlets are places on an electric circuit where power is supplied to equipment through receptacles, sockets and outlets for attachment plugs.
 - Receptacles are outlets that accept a plug to supply electric power to equipment through a cord or cable.

You must:

- Make sure electrical outlets (~~are rated equal or greater to~~) have an ampere rating that is not less than the electrical load (supplied) to be served.
- Make sure the proper mating configuration exists when connecting the attachment plug to a receptacle.
- Make sure (~~when~~) electrical outlets, cord connectors, attachment plugs and receptacles (are joined, they) will not accept (the) an attachment plug with (the same) a different voltage or current rating than that for which the device is intended.

Note: A 20-ampere T-slot receptacle or cord connector may accept a 15-ampere attachment plug of the same voltage rating.

SOME COMMON ELECTRICAL OUTLET (RECEPTACLE) CONFIGURATIONS				
	15 Ampere	20 Ampere	30 Ampere	50 Ampere
Two Pole 3 - Wire Grounding 125 Volt				
Three Pole 3 - Wire 125/250 Volt				
Note: A 20-ampere "T-slot" outlet or cord connector may accept a 15-ampere attachment plug of the same voltage rating.				

WAC 296-800-28015 Make sure electrical equipment used or located in wet or damp locations is designed for such use. You must:

- Make sure fixtures and receptacles located in wet or damp locations are approved for such use. They must be constructed or installed so that water cannot enter or accumulate in wireways, lampholders, or other electrical parts.

- Make sure cabinets, cutout boxes, fittings, boxes, and ~~((other enclosures in wet or damp locations are installed to prevent moisture or water from entering and accumulating inside.~~

- ~~- In wet locations these enclosures must be weatherproof.~~

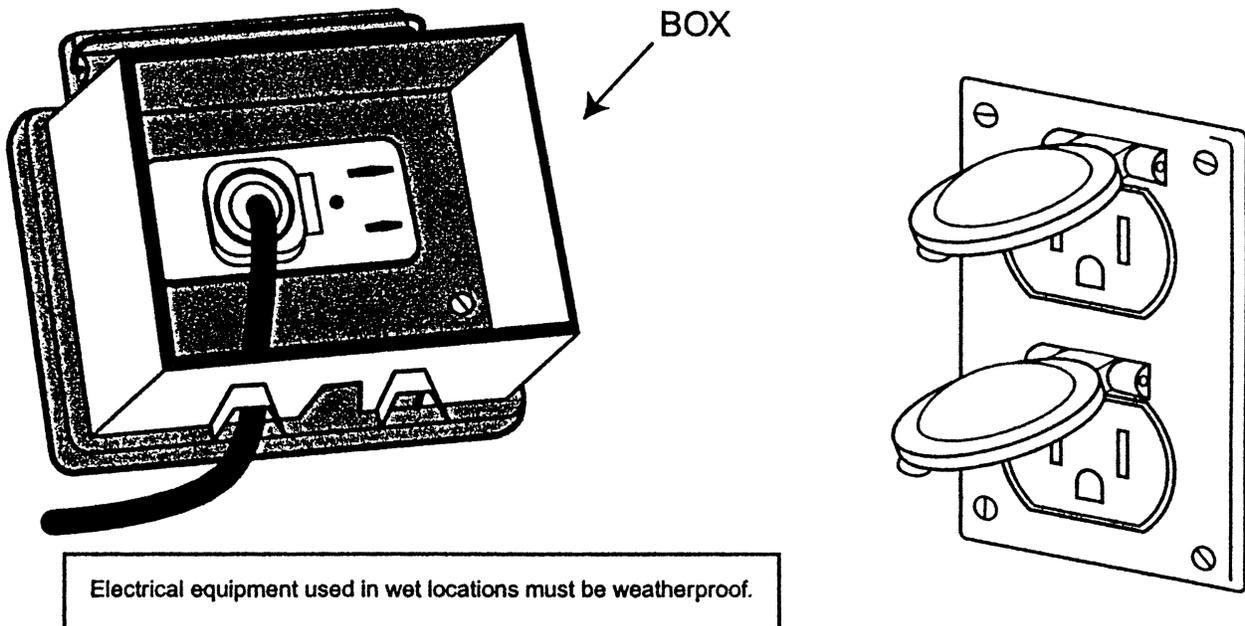
- ~~- Switches, circuit breakers, and switchboards located in wet locations must be in weatherproof enclosures.)~~ panelboard enclosures in damp or wet locations are:

- ~~- Installed to prevent moisture or water from entering and accumulating inside.~~

- ~~- Mounted so there is at least a 1/4 inch airspace between the enclosure and the wall or other supporting surface. Nonmetallic enclosures may be installed on a concrete, masonry, tile, or similar surface without the airspace.~~

- ~~- Weatherproof when used in wet locations.~~

- ~~Switches, circuit breakers, and switchboards located in wet locations must be in weatherproof enclosures.~~



AMENDATORY SECTION (Amending WSR 01-23-060, filed 11/20/01, effective 12/1/01)

WAC 296-800-28020 Make sure electrical equipment that is not marked is not used. You must:

~~((• Make sure markings are durable and appropriate to the environment.~~

~~• Appropriate markings include:~~

~~— The manufacturer's name;~~

~~or~~

~~— Trademark;~~

~~or~~

~~— The organization responsible for the product;~~

~~and~~

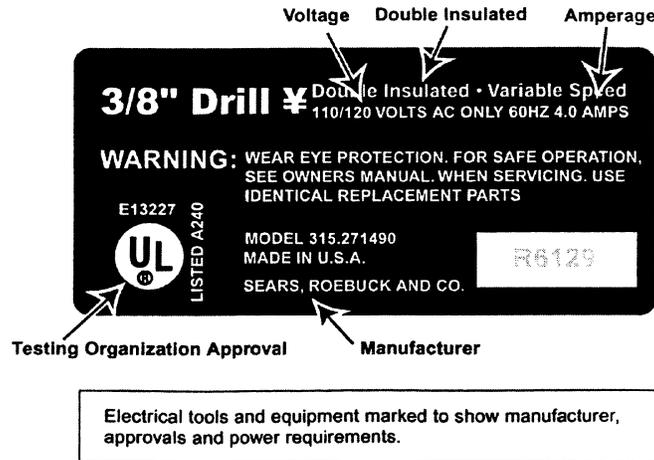
~~— Voltage, current and wattage or other ratings as necessary.))~~ • Electric equipment may not be used unless the following markings have been placed on the equipment:

— The manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the product may be identified;

AND

— Voltage, current and wattage, or other ratings as necessary.

• Make sure markings are durable and appropriate to the environment.



AMENDATORY SECTION (Amending WSR 01-11-038, filed 5/9/01, effective 9/1/01)

WAC 296-800-28022 Identify disconnecting means. You must:

• Make sure the ~~((disconnect))~~ disconnecting means (such as on/off switches and circuit breakers) is marked to show when it is open and closed and what equipment it controls, unless located and

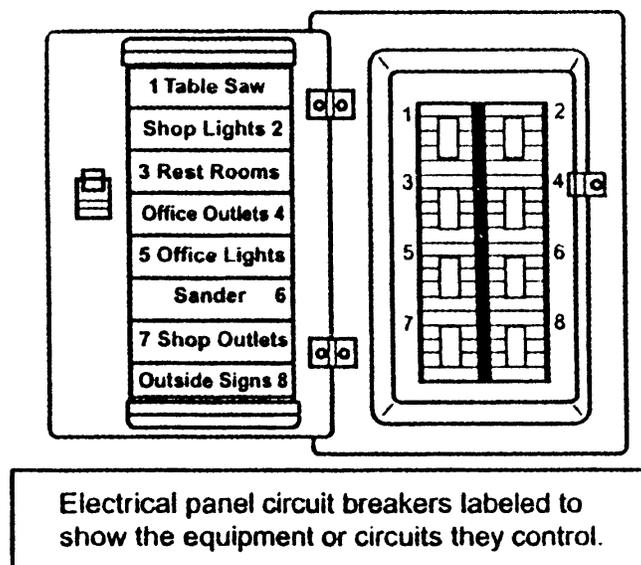
arranged so the purpose is obvious.

● Install the disconnecting means at a readily accessible location nearest the point of entrance of the service-entrance conductors.

● Make sure the disconnecting means for each motor and appliance is marked, at the disconnecting means or overcurrent device, to show when the circuit is open and closed and what circuit it controls, unless located and arranged so the purpose is obvious.

● Make sure each service, feeder and branch circuit is marked, at its disconnecting means or overcurrent device, to show when the circuit is open and closed and what circuit it controls, unless located and arranged so the purpose is obvious.

● Make sure markings are durable and appropriate to the environment.



AMENDATORY SECTION (Amending WSR 01-23-060, filed 11/20/01, effective 12/1/01)

WAC 296-800-28025 Maintain electrical fittings, boxes, cabinets and outlets in good condition. You must:

~~((+))~~ Do the following ~~((to))~~ when using covers and openings:

● ~~((Do the following))~~ When conductors enter boxes, cabinets, or fittings:

- Protect the conductor (wires) from abrasion.
- Effectively close the openings where conductors enter.
- Effectively close all unused openings.

- Provide pull boxes, junction boxes, and fittings with covers approved for the purpose.

- Make sure each outlet box has a cover, faceplate, or fixture canopy in completed installations.

- Make sure covers for outlet boxes with openings for flexible cord pendants have bushings to protect the cord, or have a smooth and well rounded surface where the cord touches the opening.

- Ground metal covers.

~~((2) Make sure the area in front of electrical panels, circuit breaker boxes and similar equipment which operates at 600 volts or less:~~

- ~~● Has sufficient working area at least thirty inches wide for operation and maintenance of the equipment.~~

- ~~● Is kept clear and free of stored materials so that employees can access this equipment for servicing, adjustments or maintenance.~~

- ~~● Has at least one access route to provide free and unobstructed access.~~

- ~~● Has at least three feet of working space in front, measured from the exposed live parts or the enclosure front. (See the work clearance table on the following page.)~~

- ~~● Has adequate indoor lighting.~~

~~(WAC 296-800-210.)~~

- ~~● Has at least six feet three inches of headroom.~~

~~This table shows the area you must keep clear depending on the layout of the electrical equipment.~~

Conditions*	0-150 volts to ground	151-600 volts to ground
a	3 ft.	3 ft.
b	3 ft.	3 1/2 ft.
c	3 ft.	4 ft.

• Minimum clear distances may be 2 feet 6 inches for equipment built or installed before 3/20/82.

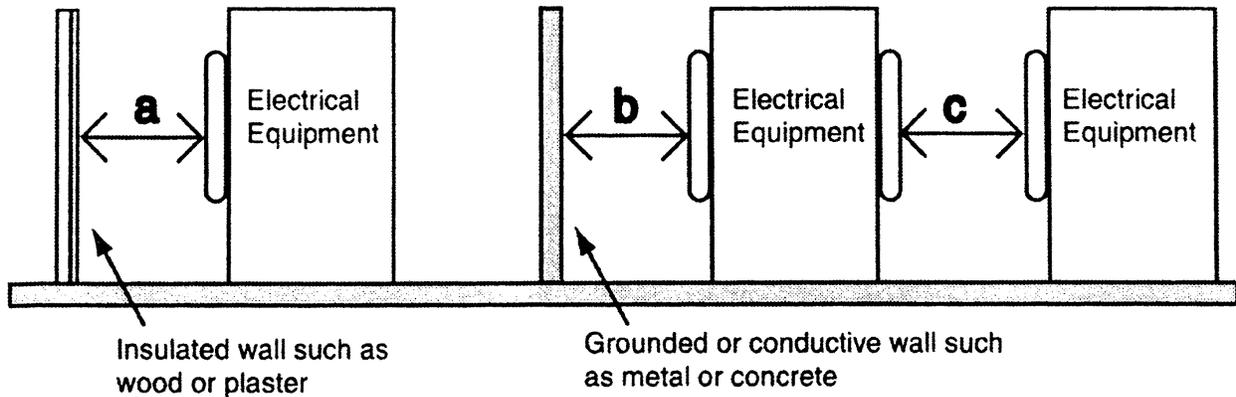
• Conditions a, b, and c are as follows:

~~-a= Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by suitable wood or other insulating material. Insulated wire or insulated bus bars operating at not over 300 volts are not considered live parts.~~

~~-b= Exposed live parts on one side and grounded parts on the other side.~~

~~-c= Exposed live parts on both sides of the workspace (not guarded as provided in condition (a) with the operator between the panels:))~~

~~((STRICKEN GRAPHIC~~



Distances are measured from live parts if they are exposed or from the enclosure front if live parts are enclosed.

~~STRICKEN GRAPHIC))~~

NEW SECTION

WAC 296-800-28027 Working space around electrical equipment.

This section applies to equipment that operates at 600 volts or less.

(1) Provide and maintain sufficient access and working space around all electrical equipment to permit ready and safe operation and maintenance of the equipment.

(2) Make sure equipment likely to require examination, adjustment, servicing, or maintenance while energized has:

- Working space in front of the equipment that is equal to the width of the equipment or thirty inches, whichever is greater.

- Sufficient working space to permit equipment doors or hinged panels to open at least 90 degrees.

- Working space in the direction of access to live parts that is not less than that listed in Table XX. Distances are measured from the live parts if they are exposed or from the enclosure front or opening if they are enclosed.

- Clear working space about service equipment, switchboards, panelboards, or motor control centers that extends from the grade, floor, or platform to a height of:

- 6.25 feet for installations built before August 13, 2007.

- 6.5 feet for installations built on or after August 13, 2007. If the height of the equipment is greater than 6.5 feet, the minimum headroom may not be less than the height of the equipment.

Note: ● Other equipment associated with the electrical installation and located above or below the electric equipment may extend not more than 6 inches beyond the front of the electric equipment.

- (3) Make sure working space is:
- Not used for storage.
 - Suitably guarded when normally enclosed live parts are exposed for inspection or servicing in a passageway or general open space.

(4) Provide at least one entrance of sufficient area to give access to the working space about electric equipment.

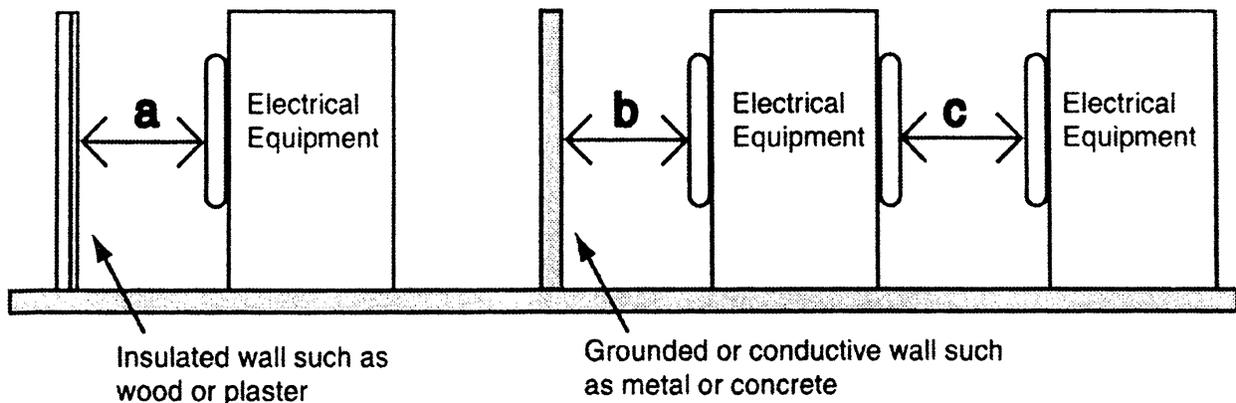
(5) Provide adequate lighting (WAC 296-800-210) for all working spaces about service equipment, switchboards, panelboards, and motor control centers installed indoors. In electric equipment rooms, the illumination must not be controlled by automatic means only.

- This table shows the area you must keep clear depending on the layout of the electrical equipment.

Table XX

Conditions ²	Minimum Clear Distance ³	Minimum Clear Distance ³
	0 - 150 volts to ground	151 - 600 volts to ground
A ¹	3 ft.	3 ft.
B	3 ft. ¹	3 1/2 ft.
C	3 ft.	4 ft.

1. Minimum clear distances may be 0.7 m (2.5 ft) for installations built before April 16, 1981.
2. Conditions A, B, and C are as follows:
 A = Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by suitable wood or other insulating material. Insulated wire or insulated bus bars operating at not over 300 volts aren't considered live parts.
 B = Exposed live parts on one side and grounded parts on the other side.
 C = Exposed live parts on both sides of the workspace (not guarded as provided in condition A with the operator between the panels).
3. Working space is not required in back of assemblies such as dead-front switchboards or motor control centers where there are no renewable or adjustable parts (such as fuses or switches) on the back and where all connections are accessible from locations other than the back. Where rear access is required to work on deenergized parts on the back of enclosed equipment, a minimum working space of 30 in. horizontally shall be provided.



Distances are measured from live parts if they are exposed or from the enclosure front if live parts are enclosed.

AMENDATORY SECTION (Amending WSR 01-23-060, filed 11/20/01, effective 12/1/01)

WAC 296-800-28030 Maintain all flexible cords and cables in good condition and use safely.

Exemption: These rules do not apply to cords and cables that are an internal part of factory assembled appliances and equipment, like the windings on motors or wiring inside electrical panels.

Note: Flexible cords and cables are typically used to connect electrical equipment to a power source. These cords can have an electrical plug to connect to a power source or can be permanently wired into the power source. The terms flexible cords, extension cord, cables and electrical cords all refer to a type of flexible cord.

You must:

(1) Perform visual inspections.

● On portable cord- and plug-connected equipment and extension cords before use on each work shift. Defects and damage to look for include:

- Loose parts.
- Deformed or missing pins.
- External defects and damage.
- Damage to the outer covering or insulation.
- Pinched or crushed covering or insulation that might indicate internal damage.

Exemption: You do not need to visually inspect portable cord- and plug-connected equipment and extension cords that stay connected once in place and are not exposed to damage until they are moved.

You must:

● Remove from service any defective or damaged cord until repaired and tested.

~~((● Make sure flexible cords and cables are used as described.))~~

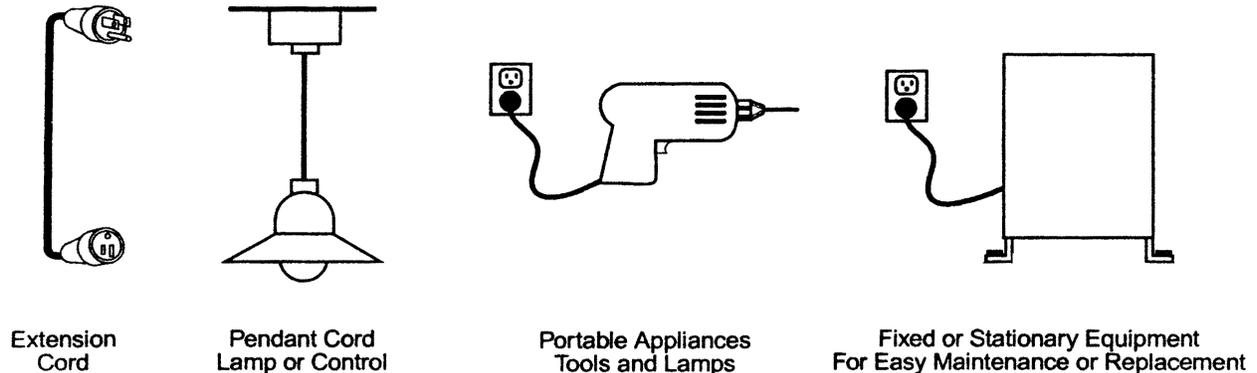
(2) Use.

● Use flexible cords only as follows:

- Wiring of equipment and appliances.
- Data processing cables approved as a part of the data processing system.
- Pendants.
- Wiring for fixtures.
- Connecting portable lamps or appliances to an approved outlet with an attachment plug.
- Connecting stationary equipment that is frequently changed with an attachment plug energized from an approved outlet.
- Preventing noise or vibration transmission.
- Appliances ~~((that have been))~~ where the fastening means and mechanical connections are designed to permit removal for maintenance and repair if the appliance is equipped with an attachment plug energized from an approved outlet.
- Elevator cables.
- Wiring of cranes and hoists.
- Portable and mobile signs.

- Connection of moving parts.

Common Acceptable Uses of Flexible Cords



Note: Extension cords (flexible cord sets) may be used on a temporary basis if you follow the rules described in the temporary use section, WAC 296-800-28030(3).

You must:

- ~~((Not use))~~ Make sure flexible cords ~~((in the following ways))~~ are NOT:
 - Used as a substitute for fixed wiring of a structure.
 - ~~((To))~~ Run through holes in walls, ceilings, or floors.
 - ~~((To))~~ Run through doorways, windows, or similar openings.
 - ~~((To attach))~~ Attached to building surfaces.
 - ~~((To conceal))~~ Concealed behind building walls, ceilings, or floors.
 - Used to raise or lower equipment.
- Make sure flexible cords and cables are approved and suitable for:
 - The way they will be used.
 - The location where they will be used.
- Do not fasten or hang cords and equipment in any way that could cause damage to the outer jacket or insulation of the cord.
- Make sure insulation on flexible cords and cables is intact.
- Make sure flexible cords and electrical cords are:
 - Connected to devices and fittings so that any pulling force on the cord is prevented from being directly transmitted to joints or terminal screws on the plug.
 - Used only in continuous lengths without splice or tap.

Note: Hard service flexible cords No. 12 or larger may be repaired or spliced if the insulation, outer sheath properties, and use characteristics of the cord are retained.

- Prohibit your employees from using wet hands to plug or unplug equipment or extension cords if the equipment is energized.

~~((Note: Hard service flexible cords No. 12 or larger may be repaired or spliced if the insulation, outer sheath properties, and use characteristics of the cord are retained.~~

~~You must:)~~

(3) Provide the following for temporary use.

- Make sure temporary electrical power and lighting installations that operate at 600 volts or less are used only:
 - During and for remodeling, maintenance, repair or demolition

of buildings, structures, or equipment, and similar activities.

- For experimental or developmental work.
- During emergencies.
- For no more than ninety days for:
 - ◆ Christmas decorative lighting.
 - ◆ Carnivals.
 - ◆ Other similar purposes.
- Make sure flexible cords and (~~electrical cords used on a temporary basis~~) cables are protected from accidental damage(~~:-~~
 - ~~By avoiding sharp corners and projections~~
 - ~~If they pass through doorways or other pinchpoints~~) as might be caused, for example, by sharp corners, projections, and doorways or other pinch points.
- Remove temporary wiring immediately upon completion of the project or purpose for which the wiring was installed.

AMENDATORY SECTION (Amending WSR 01-11-038, filed 5/9/01, effective 9/1/01)

WAC 296-800-28035 Guard electrical equipment to prevent your employees from electrical hazards. You must:

(1) Guard live parts of electric equipment operating at 50 volts or more against accidental contact by any of the following means:

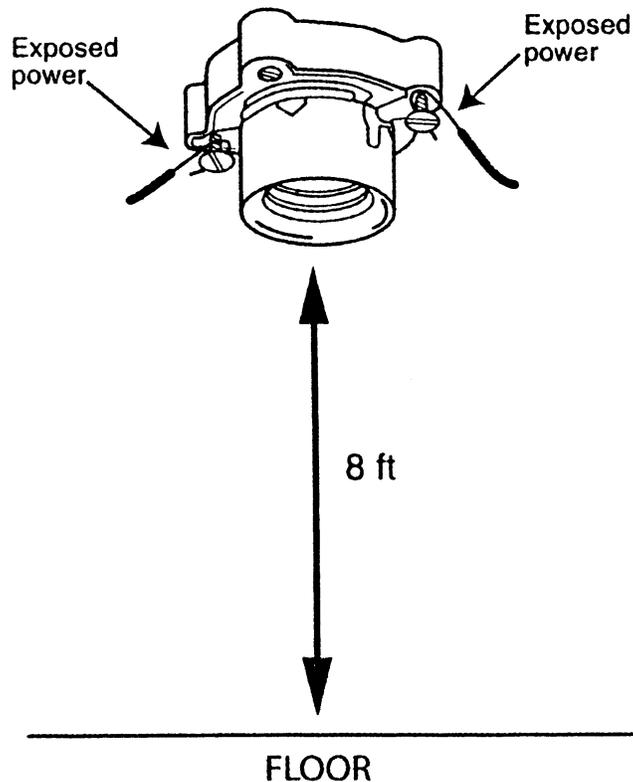
- By approved cabinets or other forms of approved enclosures.
- By location in a room, vault, or similar enclosure that is accessible only to employees qualified to work on the equipment. Entrances to rooms and other guarded locations containing exposed live parts must be marked with conspicuous warning signs forbidding unqualified persons to enter.
- By permanent, substantial partitions or screens so that only employees qualified to work on the equipment will have access within reach of the live parts. Any openings must prevent accidental contact with live parts by employees or objects employees carry.
- By location on a balcony, gallery, or platform that will exclude unqualified persons.
- By being located eight feet or more above the floor or other working surface.

(2) Make sure all electrical appliances, fixtures, lampholders, lamps, rosettes, and receptacles do not have live parts normally exposed to employee contact.

- Rosettes and cleat type lampholders at least 8 feet above the ground may have exposed parts.

(3) In locations where electric equipment would be exposed to physical damage, enclosures or guards must be so arranged and of such strength as to prevent such damage.

Live Parts Guarded by Distance



(4) Mark entrances to rooms and other guarded locations containing exposed live parts with conspicuous warning signs forbidding unqualified persons to enter.

AMENDATORY SECTION (Amending WSR 02-16-047, filed 8/1/02, effective 10/1/02)

WAC 296-800-28040 Make sure electrical equipment is effectively grounded. You must:

- Make sure the path to ground from circuits, equipment, and enclosures is permanent ~~((and)),~~ continuous, and effective.

- Make sure ~~((equipment connected by cord and plug is grounded under these conditions:~~

- ~~— Equipment with exposed noncurrent carrying metal parts.~~

- ~~— Cord and plug connected equipment which may become energized.~~

- ~~— Equipment that operates at over 150 volts to ground))~~ exposed noncurrent-carrying metal parts of cord- and plug-connected equipment that may become energized are grounded under any of the following conditions:

- ~~— If operated at over 150 volts to ground, except for guarded motors and metal frames of electrically heated appliances if the appliance frames are permanently and effectively insulated from ground.~~

- Equipment in hazardous locations. (WAC 296-24-95613)

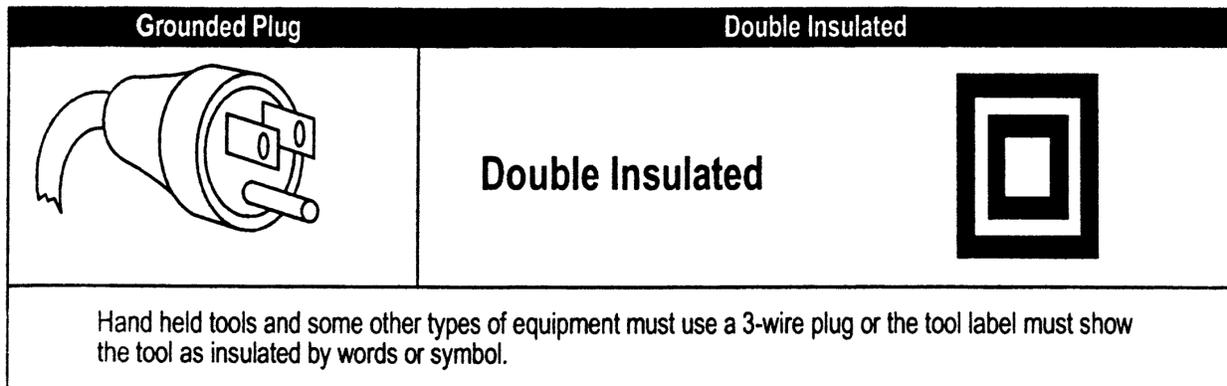
~~((Exemption: This does not apply to guarded motors and metal frames of electrically heated appliances, if the appliance frames are permanently and effectively insulated from ground.~~

You must:

~~● Ground the following type of equipment:))~~ - If the equipment is of the following types:

- Hand-held motor-operated tools.
- Stationary and fixed motor-operated tools.
- Light industrial motor-operated tools.
- Refrigerators.
- Freezers.
- Air conditioners.
- Clothes washers and dryers.
- Dishwashers.
- Electrical aquarium equipment.
- Sump pumps.
- Hedge clippers.
- Electric lawn mowers.
- Electric snow blowers.
- Wet scrubbers.
- Tools likely to be used in damp or wet locations.
- Appliances used by employees standing on the ground, on metal floors or working inside of metal tanks or boilers.
- Portable hand lamps.
- Portable and mobile X-ray and associated equipment.
- Tools likely to be used in wet and conductive locations.

Note: Grounding can be achieved by(+) using tools and appliances equipped with an equipment grounding conductor (three-prong plug and grounded electrical system).

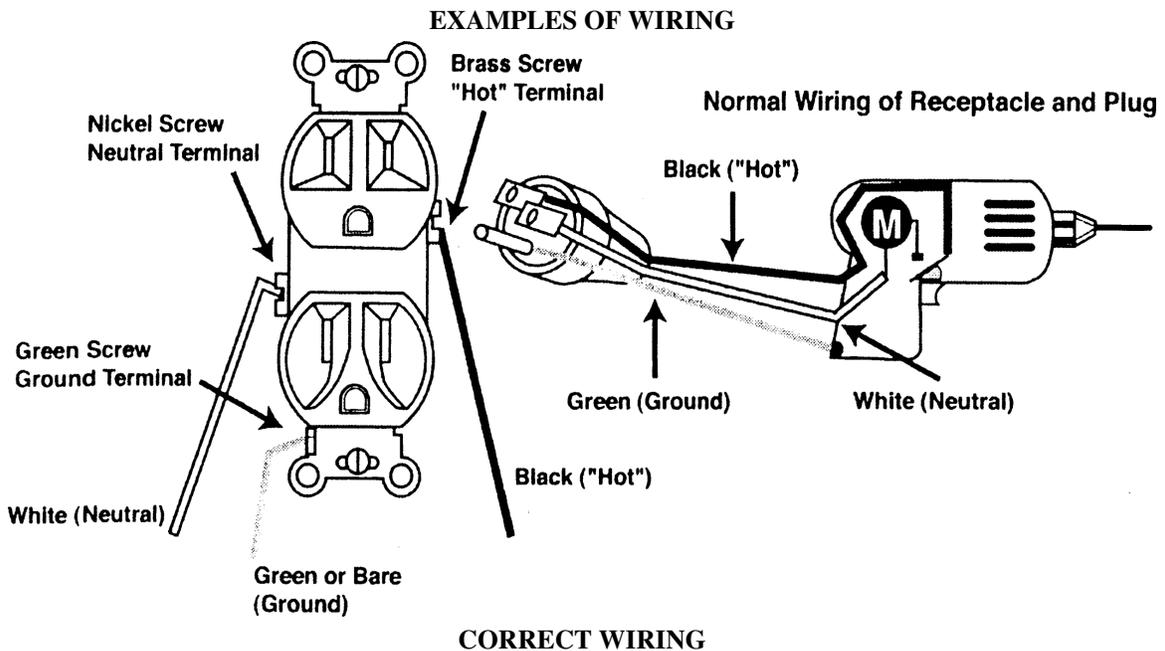


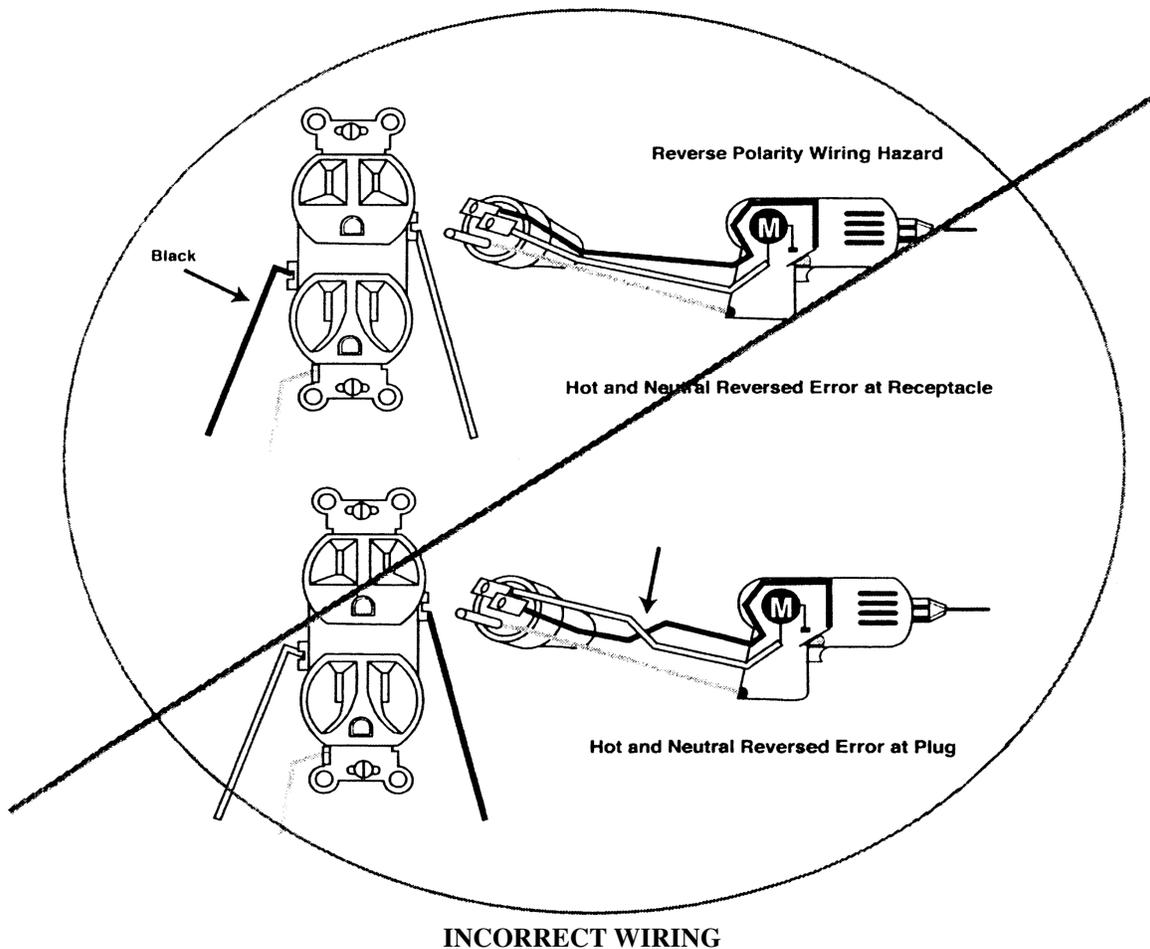
You must:

● Make sure exposed metal parts of fixed equipment that do not conduct electricity, but may become energized, are grounded under any of the following conditions:

- If the equipment is in a wet or damp location and is not isolated.
- If within 8 feet vertically or 5 feet horizontally of ground or grounded metal objects and subject to employee contact.
- If in electrical contact with metal.

- If in a hazardous (classified) location.
- If supplied by a metal-clad, metal-sheathed, or grounded metal raceway wiring method.
- If equipment operates with any terminal at over 150 volts to ground.
 - Make sure ((ground wires are identified and look different than the other conductors (wires))) a conductor used as a grounded conductor is identifiable and distinguishable from all other conductors.
 - Make sure a conductor used as an equipment grounding conductor is identifiable and distinguishable from all other conductors.
 - Make sure grounded conductors are not attached to any terminal or lead so as to reverse polarity of the electrical outlet or receptacle. See illustration - Examples of wiring.
 - Make sure grounding terminals or grounding-type devices on receptacles, cords, connectors, or attachments plugs are not used for purposes other than grounding.





AMENDATORY SECTION (Amending WSR 02-16-047, filed 8/1/02, effective 10/1/02)

WAC 296-800-28045 Make sure electrical equipment has overcurrent protection. You must:

- Make sure all electrical circuits that are rated at 600 volts or less have overcurrent protection.
- Protect conductors and equipment from overcurrent according to their ability to safely conduct electrical current.
- Make sure overcurrent devices do not interrupt the continuity of grounded conductors unless all conductors are opened at the same time, except for motor running overload protection.

~~((Protect employees from electrical arcing or suddenly moving electrical parts by locating fuses and circuit breakers in safe places. If this is not possible, install shields on fuses and circuit breakers.))~~ - Locate or shield fuses and circuit breakers so that employees will not be burned or otherwise injured by their operation.

- Make sure handles or levers of circuit breakers, and similar parts that may move suddenly in such a way that persons in the vicinity are likely to be injured by being struck by them, are guarded or isolated.

● Make sure the following fuses and thermo cutouts have disconnecting ~~((mechanisms))~~ means:

- All cartridge fuses accessible to nonqualified persons.

- All fuses ~~((on))~~ in circuits over 150 volts to ground.

- All thermal cutouts on circuits over 150 volts to ground.

~~((-))~~ ● The disconnecting ~~((mechanisms))~~ means must be installed so you can disconnect the fuses or thermal cutouts without disrupting service to equipment and circuits unrelated to those protected by the overcurrent device.

● Provide easy access to overcurrent devices for each employee or authorized building management personnel.

● ~~((Protect the))~~ Locate overcurrent devices ~~((by locating them))~~:

- Away from easily ignitable material.

- Where they ~~((must be placed to avoid exposure))~~ are not exposed to physical damage.

● Make sure circuit breakers ~~((-~~

~~-))~~ clearly indicate ~~((when))~~ whether they are open (off) ~~((and))~~ or closed (on).

~~((That))~~ ● Install circuit breakers that operate vertically ~~((are installed))~~ so the handle is in the "up" position when the breaker is closed (on). ~~((See WAC 296-24-95603 (2)(c) for more information))~~

- Circuit breakers used as switches in 120-volt, fluorescent lighting circuits must be approved for that purpose and marked "SWD." ~~((See WAC 296-24-95603 (2)(c) for more information~~

~~- That have arcing or suddenly moving parts, are shielded or located so employees will not get burned or injured by the operation of the circuit breaker.~~

◆ ~~Make sure fuses that have arcing or suddenly moving parts, are shielded or located so employees will not get burned or injured by the operation of the fuses.)~~