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 must be identifiable and distinguishable from all other conductors.

(ii) A conductor used as an equipment grounding conductor must 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, you must identify each ungrounded conductor of a multiwire branch circuit, where accessible, by phase and system. You must permanently post the means of identification at each branch-circuit panelboard.

(b) **Receptacles and cord connectors.**

(i) Receptacles installed on 15- and 20-ampere branch circuits must be of the grounding type except as permitted for replacement receptacles in (b)(iv) of this subsection. You must only install grounding-type receptacles 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 must 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) You must ground 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 must include or provide an equipment grounding conductor to which the grounding contacts of the receptacle or cord connector must be connected.

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

(A) Where a grounding means exists in the receptacle enclosure or a grounding conductor is installed, you must use grounding-type receptacles and you must connect them to the grounding means or conductor;

(B) You must provide ground-fault circuit-interrupter protected receptacles 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 must 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 cir-

cuit-interrupter; you must mark the replacement receptacle "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 must 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 must 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 must 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 must 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, you must 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 must comply with the following requirements:

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

(II) You must designate one or more competent persons to implement the program;

(III) You must visually inspect 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, before each day's use for external defects, such as deformed or missing pins or insulation damage, and for indications of possible internal damage. You must not use equipment found damaged or defective until repaired;

(IV) You must perform the following tests 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:

• You must test all equipment grounding conductors for continuity and proven to be electrically continuous;

• You must test each receptacle and attachment cap or plug for correct attachment of the equipment grounding conductor. You must connect the equipment grounding conductor to its proper terminal; and

• You must perform all required tests 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 you must test cord sets and receptacles which are fixed and not exposed to damage at intervals not exceeding six months;

(V) You must 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) You must record tests performed as required in (c)(ii)(C) of this subsection. This test record must identify each receptacle, cord set, and cord- and plug-connected equipment that passed the test and must indicate the last date it was tested or the interval for which it was tested. You must keep this record by means of logs, color coding, or other effective means and you must maintain it until replaced by a more current record. You must make the record available on the job site for inspection by the assistant secretary and any affected employee.

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

(i) Where connected to a branch circuit having a rating in excess of 20 amperes, lampholders must be of the heavy-duty type. A heavy-duty lampholder must 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 must comply with the following provisions:

(A) A single receptacle installed on an individual branch circuit must 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 must 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.** You must install a receptacle outlet 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 must have a separation of not less than 1 foot where not placed on racks or brackets. Conductors supported on poles must 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, must conform to the minimum clearances specified in Table S-6.

Table S-6—Clearances From Ground

	Installations built before August 13, 2007		Installations built on or after August 13, 2007	
Distance	**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.)

	Installations built before August 13, 2007		Installations built on or after August 13, 2007	
Distance	**Maximum Voltage**	**Conditions**	**Voltage to ground**	**Conditions**
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.)
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 must 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. You must maintain vertical clearance of final spans above, or within 3 feet measured horizontally of, platforms, projections, or surfaces from which they might be reached 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 must have a vertical clearance of not less than 8 feet above the roof surface. You must maintain the vertical clearance above the roof level 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 must 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.** You must locate lamps for outdoor lighting 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) You must provide means to disconnect all conductors in a building or other structure from the service-entrance conductors. The service disconnecting means must plainly indicate whether it is in the open or closed position and must be installed at a readily accessible location nearest the point of entrance of the service-entrance conductors.

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

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

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

(i) You must guard service-entrance conductors installed as open wires to make them accessible only to qualified persons.

(ii) You must post signs warning of high voltage 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) You must protect conductors and equipment 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) You must provide a disconnecting means 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 must 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 must 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, must be guarded or isolated.

(vi) Circuit breakers must 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 must be the closed (on) position.

(viii) Circuit breakers used as switches in 120-volt and 277-volt, fluorescent lighting circuits must 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 must 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 must 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 must 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) You must coordinate the operating time of the protective device, the available short-circuit current, and the conductor used 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.** You must ground systems that supply premises wiring as follows:

(i) You must ground the neutral conductor of all 3-wire DC systems;

(ii) You must ground 2-wire DC systems operating at over 50 volts through 300 volts between conductors:

(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) You must ground AC circuits of less than 50 volts 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) You must ground AC systems of 50 volts to 1000 volts 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 must be as follows:

(i) You must ground one conductor of a single-phase, 2-wire system;

(ii) You must ground the neutral conductor of a single-phase, 3-wire system;

(iii) You must ground the common conductor of a multiphase system having one wire common to all phases;

(iv) You must ground one phase conductor of a multiphase system where one phase is grounded; and

(v) You must ground the neutral conductor of a multiphase system in which one phase is used as a neutral conductor.

(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) You must bond a system conductor that is required to be grounded by the provisions in (b) of this subsection to the generator frame where the generator is a component of a separately derived system.

(d) **Grounding connections.**

(i) For a grounded system, you must use a grounding electrode conductor to connect both the equipment grounding conductor and the grounded circuit conductor to the grounding electrode. You must connect both the equipment grounding conductor and the grounding electrode conductor 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, you must connect the equipment grounding conductor to the grounding electrode conductor at the service equipment. For an ungrounded separately derived system, you must connect the equipment grounding conductor 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 must 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 must be permanent, continuous, and effective.

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

(i) You must ground metal cable trays, metal raceways, and metal enclosures for conductors, 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) You must ground metal enclosures for service equipment.

(iii) You must ground 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.

(iv) You must ground exposed noncurrent-carrying metal parts of fixed equipment that may become energized 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) You must ground exposed noncurrent-carrying metal parts of cord- and plug-connected equipment that may become energized 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, you must distinctively mark the equipment to indicate that the tool or appliance utilizes an approved system of double insulation.

(g) **Nonelectrical equipment.** You must ground the metal parts of the following nonelectrical equipment: 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) You must ground noncurrent-carrying metal parts of fixed equipment, if required to be grounded by this part, 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 must 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 must 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, must comply with the following:

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

(B) You must connect exposed noncurrent-carrying metal parts of portable and mobile equipment by an equipment grounding conductor to the point at which the system neutral impedance is grounded.

(C) You must provide ground-fault detection and relaying to automatically deenergize any high voltage system component that has devel-

oped a ground fault. You must continuously monitor the continuity of the equipment grounding conductor 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 must be isolated from and separated in the ground by at least 20 feet from any other system or equipment grounding electrode, and there must be no direct connection between the grounding electrodes, such as buried pipe, fence, and so forth.

(ii) You must ground all noncurrent-carrying metal parts of portable equipment and fixed equipment, including their associated fences, housings, enclosures, and supporting structures. 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.

[Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, and 49.17.060. WSR 15-24-100, § 296-24-95705, filed 12/1/15, effective 1/5/16. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060, and chapter 49.17 RCW. WSR 12-16-064, § 296-24-95705, filed 7/31/12, effective 9/1/12.]