



**Mid-1880s.** *The back of this photo has the following info: "An excellent picture of horse powered stationary threshing machine used in the mid-1880s. Twelve horses are used on the horse power, with the driver standing in the middle of the circle. The grain is being threshed directly from the headers, and the straw is being stacked at the end of the conveyor." Also on the photo were references to Arlington, OR and the names Marion T. Weatherford and W. M. Pierce.*

Photo by June Drake  
Oregon Historical Society, #OrHi 23216

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## **437-004-2810 General Requirements.**

**(1) Scope.** This standard (4/S) covers electrical work and equipment in buildings and on premises. It applies to all work and equipment covered by other sections of Subdivision 4/S.

**(2)** Unless stated otherwise in OAR 437-004-2810 through 437-004-3075, all electrical work, equipment and systems must comply with standards under the jurisdiction of the Oregon Building Codes Division, Department of Consumer and Business Services.

**(3)** Do not allow employees to work near live power sources without protection from shock.

**(4)** Isolate exposed live electrical conductors from contact by persons or equipment.

**NOTE:** Paragraphs **(3)** and **(4)** above do not apply to electric fences or containment devices.

**(5)** Lights 7 feet or closer to the floor or work surface must have a guard, fixture or holder to protect the bulb or tube from breakage.

**(6)** Only qualified persons, authorized by the employer may make electrical repairs. (See Subdivision 4/B.)

**(7)** Install or remove fuses from live terminals only with special tools insulated for the voltage.

**(8)** When the exact location of underground electric power lines is unknown, workers using jackhammers, bars or other hand tools that may contact a line must use insulated protective gloves.

**(9)** Before beginning work near exposed lines or equipment, the employer must determine if they are live. If they are, you must advise the employees of the position of the lines, the hazards involved and the protective measures they must use.

**(10)** Before beginning work like digging, drilling or remodeling, that may lead to hidden power sources the employer must locate them and determine their voltage. Locate underground lines by calling 1-800-332-2344 or in the Portland Metropolitan area 246-6699. The employer must then:

**(a)** Post and maintain proper warning signs where such circuits exist; and

**(b)** Advise the employees of the position of the lines, the hazards involved and the protective measures they must use.

**NOTE:** If the work covered by **(8)** and **(9)** above might involve voltages over 750v, see OAR 437-004-3050.

**(11)** There must be sufficient space near electrical equipment to permit safe operation and maintenance.

**(a)** Near exposed parts, the minimum clearance from floor to ceiling must be at least 76 inches. There must be a clear radius of at least 36 inches in front of the panel.

(b) There must be enough clearance to permit at least a 90 degree opening of all doors or hinged panels.

(c) Do not store anything in front of electrical panels.

(12) There must be suitable barriers or other means to ensure that work space for electrical equipment is not used as a passageway when energized parts are exposed.

(13) Require workers to report all electric shocks to management or supervisors immediately.

(a) Check the equipment causing the shock and remove from service or repair it before further use.

(14) Electrical equipment must be free from recognized hazards that may cause death or serious physical harm. Use the criteria below to determine the safety of equipment.

(a) Electrical equipment must be listed or labeled, except custom-made components and utilization equipment. (See Division 4/B, OAR 437-004-0100, for definitions of listed and labeled.)

(b) Mechanical strength and durability, and for parts that enclose and protect other equipment, the adequacy of the protection.

(c) Classification by type, size, voltage, current capacity or specific use.

(d) Other factors that contribute to the practical safeguarding of employees using or likely to contact the equipment.

(15) Follow manufacturer's instructions or recommendations when installing listed or labeled equipment.

(16) In wet or damp locations, use only fixtures approved for that purpose. Install them so that water cannot enter or accumulate in wireways, lampholders, or other electrical parts.

(17) All pull boxes, junction boxes and fittings must have approved covers. Metal covers must be grounded.

(18) All wall plugs and switches must have approved, unbroken covers or faceplates and no broken parts.

(19) Receptacles, plugs, fixtures, lamp-holders lamps and other holders and outlets must have no exposed live parts.

**NOTE:** Rosettes and cleat-type lamp-holders may have exposed parts if they are 8 feet or higher above the floor.

**Stat. Auth.:** ORS 654.025(2) and 656.726(4).

**Stats. Implemented:** ORS 654.001 through 654.295.

**Hist:** OR-OSHA Admin. Order 4-1998, 1/8/28/98, ef. 10/1/98.  
OR-OSHA Admin. Order 9-2006, f. 9/22/06, ef. 9/22/06.

## **437-004-2850 Temporary Lighting and Wiring.**

### **Temporary Wiring**

- (1) Walkways and similar locations must be kept clear of power cords.
- (2) Ground all temporary wiring.
- (3) Keep wiring equipment as vapor, dust, or fiber tight as intended by the manufacturer. There must be no loose or missing screws, gaskets, threaded connections, or other impairments to this tight condition.
- (4) Take precautions to make open wiring inaccessible to unauthorized personnel.
- (5) Temporary electrical power and lighting installations are acceptable during construction, remodeling, maintenance, repair, or demolition of buildings, structures, equipment, or similar activities.
- (6) Temporary electrical power and lighting installations are acceptable for not more than 90 days for decorative lighting and as in (5) above.

### **Temporary Lighting**

- (7) Temporary lights must be at least 7 feet above the work surface or have guards to prevent contact with the bulb.
- (8) Temporary lights must have electric cords, connections and insulation rated for their use.
- (9) Do not suspend temporary lights by their cords unless the manufacturer's instructions allow the practice.
- (10) Do not use metal shell, paper lined portable hand lamp holders. Hand lamps must have a handle and a substantial guard over the bulb.
- (11) Portable extension lamps used where flammable vapors, gases, combustible dusts, easily ignitable fibers or flyings are present, must be approved for the type of hazard involved. Do not modify, repair or add to these systems without approval of the manufacturer.

**Stat. Auth.:** ORS 654.025(2) and 656.726(4).

**Stats. Implemented:** ORS 654.001 through 654.295.

**Hist:** OR-OSHA Admin. Order 4-1998, 1/8/28/98, ef. 10/1/98.

## **437-004-2860 Flexible Cable and Extension Cords.**

- (1) Extension cords used with portable electric tools and appliances must be at least three-wire type and have an approved grounding plug and receptacle providing ground continuity.

- (2) Use only extension cords rated for the intended use.
- (3) Do not use worn or frayed electric cords and cables.
- (4) Protect flexible cables and extension cords against damage caused by traffic, sharp corners, pinching or projections.
- (5) Cover or elevate cables that pass through work areas to protect them from damage.
- (6) Do not use staples to fasten flexible cables and extension cords. Do not hang them from nails or suspend them by wire.
- (7) Do not use flexible cables and extension cords as a substitute for fixed structural wiring.
- (8) Flexible cables and extension cords must not run through holes in walls, ceilings, or floors or through doorways, windows, or similar openings, except during construction.
- (9) Electrical conductors must be spliced or joined in splicing devices suitable for the use, by brazing, welding or soldering with a fusible metal or alloy.
  - (a) Secure soldered splices first mechanically and electrically without solder, then solder. (Use rosin-core solder, NOT acid core solder, when joining electrical conductors.)
  - (b) Insulation on splices and joints and the free ends of conductors must be equivalent to the original insulation.
  - (c) Splices for flexible cords must provide flexibility and use characteristics of the original cord. Vulcanized splices or equivalent means, such as shrinkable materials, are acceptable for repairs.
- (10) Do not plug extension cords together to make them longer unless the resultant cord is rated to carry the load.

**Stat. Auth.:** ORS 654.025(2) and 656.726(4).

**Stats. Implemented:** ORS 654.001 through 654.295.

**Hist:** OR-OSHA Admin. Order 4-1998, 1/8/28/98, ef. 10/1/98.

## **437-004-2870 Attachment Plugs and Receptacles.**

- (1) Attachment plugs must be heavy enough to endure rough use and have a suitable cord grip to prevent strain on the terminal screws.
- (2) Use only approved, grounding type attachment plugs.
- (3) Use only approved concealed contact type receptacles for attachment plugs. They must extend ground continuity. They must allow removal of the plug without exposing live parts to contact.

- (4)** Polarized attachment plugs, receptacles and cord connectors must have proper continuity.
- (5)** Use only attachment plugs, receptacles and cord connectors that have the grounded (common) terminal conductor identified. If the terminal is not visible, the connection hole must be marked with the word "white."
- (6)** The terminal for the equipment grounding conductor (bare wire) must have:
- (a)** A green colored, not easily removable terminal screw with hexagonal head; or
  - (b)** A green colored, hexagonal, not easily removable terminal nut; or
  - (c)** A green colored pressure wire connector.
  - (d)** If the terminal for the grounding conductor is not visible, mark the conductor entrance hole with the word "green" or otherwise identify it with the color green.
  - (e)** A grounded conductor must not be attached to any terminal or lead to reverse the designated polarity.
- (7)** Where portable cords supply different voltages or types of current (A.C. or D.C.) receptacles and attachment plugs must not be interchangeable.
- (8)** Attachment plugs or other connectors supplying equipment at more than 300 volts must have skirts or otherwise confine arcs.
- (9)** Do not use a grounding terminal or grounding-type device on a receptacle, cord connector, or attachment plug for purposes other than grounding.

**Stat. Auth.:** ORS 654.025(2) and 656.726(4).

**Stats. Implemented:** ORS 654.001 through 654.295.

**Hist:** OR-OSHA Admin. Order 4-1998, 1/8/28/98, ef. 10/1/98.

## **437-004-2880 Cord and Plug-connected Equipment.**

- (1)** Portable or plug-connected equipment with noncurrent-carrying metal parts must be grounded.
- (2)** It is not necessary to ground portable tools and appliances with approved double insulation, or its equivalent, but they must have distinctive markings.
- (3)** Ground exposed noncurrent-carrying metal parts of fixed electrical equipment, including motors, frames, electrically driven machinery, refrigerators, freezer, electric ranges, clothes dryers, etc.

- (4) Cord and plug-connected high-pressure spray washing machines must have a factory installed ground-fault circuit interrupter that is an integral part of the attachment plug or is in the supply cord within 12 inches of the attachment plug.
- (5) Enclose or separate parts of electric equipment that in ordinary operation produces arcs, sparks, flames, or molten metal. Isolate this equipment from all combustible material.
- (6) Do not use electrical equipment without descriptive markings that identify the approving organization (such as U.L.) for the product. Other markings that give voltage, current, wattage, or other ratings as necessary must also be visible.

**Stat. Auth.:** ORS 654.025(2) and 656.726(4).

**Stats. Implemented:** ORS 654.001 through 654.295.

**Hist:** OR-OSHA Admin. Order 4-1998, f/8/28/98, ef. 10/1/98.

### 437-004-2900 Grounding and Bonding.

- (1) The path from circuits, equipment, structures, and conduit enclosures to ground must be permanent and continuous with enough capacity to conduct safely the currents that might be imposed on it. The path must also have impedance low enough to limit the potential above ground and to result in the operation of the over current devices in the circuit.
- (2) Driven ground rods must, where practicable, have a resistance to ground not to exceed 25 ohms. Where the resistance is not as low as 25 ohms, use two or more electrodes connected in parallel.
- (3) Check grounding circuits to ensure that the circuit between the ground and the grounded power conductor has a resistance low enough to permit enough current to flow to cause the fuse or breaker to interrupt the circuit.
- (4) Conductors used for bonding and grounding stationary and moveable equipment must be able to carry the anticipated current.
- (5) **Outside conductors, 600 volts, nominal or less.** Paragraphs (a), (b), (c), and (d) below apply to branch circuit, feeder, and service conductors rated 600 volts, nominal, or less and run outdoors as open conductors. Paragraph (e) below applies to lamps installed under these conductors.
- (a) Conductors on poles must provide a horizontal climbing space not less than the following:
- (A) Power conductors below communication conductors – 30 inches.
- (B) Power conductors alone or above communication conductors: 300 volts or less – 24 inches; more than 300 volts – 30 inches.
- (b) Clearance from ground to open conductors must conform to the following minimum clearances:

- (A) 10 feet above finished grade, sidewalks, or from any platform or projection from which they might be reached.
  - (B) 12 feet over areas subject to vehicle traffic other than truck traffic.
  - (C) 15 feet over areas other than those in paragraph (5)(b)(D) below, where there may be truck traffic.
  - (D) 18 feet over public streets, alleys, roads, and driveways.
- (c) Conductors must have a clearance of at least 3 feet from windows, doors, porches, fire escapes, or similar locations. Conductors run above the top level of a window do not have to be 3 feet away.
- (d) Conductors must have a clearance of not less than 8 feet from the highest point of roofs over which they pass, except that:
- (A) Where the voltage between conductors is 300 volts or less and the roof has a slope of not less than 4 inches in 12, the clearance from roofs must be at least 3 feet, or
  - (B) Where the voltage between conductors is 300 volts or less and the conductors do not pass over more than 4 feet of the overhang portion of the roof and they terminate at a through-the-roof raceway or approved support, the clearance from roofs must be at least 18 inches.
- (e) Lamps for outdoor lighting must be below all live conductors, transformers, or other electric equipment, unless the equipment has a disconnecting means that is lockable in the open position or unless there are adequate clearances or other safeguards for lamp replacement.

**Stat. Auth.:** ORS 654.025(2) and 656.726(4).  
**Stats. Implemented:** ORS 654.001 through 654.295.  
**Hist:** OR-OSHA Admin. Order 4-1998, 1/8/28/98, ef. 10/1/98.

## **437-004-2950 Switches and Circuit Breakers.**

- (1) There must be at least 3 feet of clear space in front of switch centers or panels. Passageways to switch centers or panels must be unobstructed.
- (2) There must be enclosures or screens around live parts of electrical switchboards and panelboards.
- (3) Each disconnecting means for motors and appliances, and each service feeder or branch circuit at the point where it originates, must have legible markings to indicate their purpose unless the purpose is evident.

- (4) Locate or shield disconnecting means to avoid injury to employees. Do not use open knife switches.
- (5) Securely mount boxes for disconnecting means and keep their covers in place.
- (6) Boxes and disconnecting means in damp or wet locations must be waterproof.
- (7) There must be sufficient light for all indoor working spaces around service equipment, switchboards, panelboards, and motor control centers.
- (8) The minimum headroom of working spaces around service equipment, switchboards, panelboards, or motor control centers must be 6 feet 3 inches.

**Stat. Auth.:** ORS 654.025(2) and 656.726(4).

**Stats. Implemented:** ORS 654.001 through 654.295.

**Hist:** OR-OSHA Admin. Order 4-1998, f/8/28/98, ef. 10/1/98.

### **437-004-3000 Identification and Load Ratings.**

- (1) Name plates, rating data, and marks of identification on electrical equipment and electrically operated machines must be present and legible.
- (2) Do not change the circuit protection in existing installations to increase the load to more than the load rating of the circuit wiring.
- (3) Do not allow tampering, bridging, or using oversize fuses. Require workers to report immediately to management or a qualified electrician, any fuses or breakers that blow repeatedly.
- (4) Do not attempt to restart electric motors that kick out repeatedly.

**Stat. Auth.:** ORS 654.025(2) and 656.726(4).

**Stats. Implemented:** ORS 654.001 through 654.295.

**Hist:** OR-OSHA Admin. Order 4-1998, f/8/28/98, ef. 10/1/98.

### **437-004-3050 Work Near Overhead Lines.**

#### **Clearance or Safeguards Required**

**Note:** High voltage is 750 v or higher.

- (1) Isolate exposed overhead conductors from contact by persons or equipment.
- (2) Do not store irrigation pipe within 100 feet of overhead high voltage conductors.
- (3) Do not allow upending if irrigation pipe is within 100 feet of overhead conductors.

- (4)** Do not set up or operate any part of a water or irrigation system, or any other device that discharges a conductive liquid, so that the discharge is toward or may come within 10 feet of overhead high-voltage lines or any other exposed electric conductor.
- (5)** Do not require or permit an employee to pass or work near high-voltage lines, unless you effectively guard against danger from contact.
- (6)** No work activity may bring workers or equipment within 10 feet of high-voltage lines.
- (7)** Do not operate equipment or machines near power lines except:
- (a)** When electrical distribution and transmission lines are deenergized and visibly grounded at the point of work or where insulating barriers are in place to prevent physical contact with the lines;
  - (b)** For lines rated 50 kV. or below, minimum clearance between the lines and any part of the object must be 10 feet;
  - (c)** For lines rated more than 50 kV. minimum clearance between the lines and any part of the object must be 10 feet plus 0.4 inches for each 1 kV., more than 50 kV., or twice the length of the line insulator but never less than 10 feet.
  - (d)** In transit, the clearance must be a minimum of 4 feet for voltages less than 50 kV., 10 feet for voltages more than 50 kV. up to and including 345 kV., and 16 feet for voltages up to and including 750 kV.
  - (e)** A person must observe clearances and give timely warning for all work where it is difficult for the operator to maintain the desired clearance by sight.

### **Warning Sign Required**

**(8)** The employer must post and keep in plain view of the operator on each derrick, power shovel, drilling rig, hay loader, hay stacker or similar apparatus, any part of which is capable of vertical, lateral or swinging motion, a warning sign legible at 12 feet reading "Unlawful to operate this equipment within 10 feet of high-voltage lines."

### **Notification to Power Company and Responsibility for Safeguards**

**(9)** When any work may be within 10 feet of any high-voltage line, the person or persons responsible for the work must promptly notify the power company and is responsible for the completion of required safety measures before beginning the work.

**Stat. Auth.:** ORS 654.025(2) and 656.726(4).

**Stats. Implemented:** ORS 654.001 through 654.295.

**Hist:** OR-OSHA Admin. Order 4-1998, 1/8/28/98, ef. 10/1/98.

**437-004-3075 Agricultural Buildings with Special Hazards.**

**(1) Scope.** These standards apply to the following agricultural buildings or parts of buildings or adjacent areas.

**(a)** Agricultural buildings where excessive dust and dust with water may accumulate. This includes all areas of poultry, livestock and fish confinement systems, where litter dust or feed dust, including mineral feed particles may accumulate.

**(b)** Agricultural buildings where a corrosive atmosphere exists. This includes areas where poultry and animal excrements may cause corrosive vapors; corrosive particles may combine with water; the area is damp and wet due to periodic washing for cleaning and sanitizing with water and cleansing agents; or where similar conditions exist.

**(2) Wiring.** Use types UF, NMC, copper SE, or other cables or raceways suitable for the location, with approved termination fittings. Secure all cables within 8 inches of each cabinet, box, or fitting.

**(3) Enclosures.** Boxes, fittings, wiring devices, switches, circuit breakers, controllers and fuses including push-buttons, relays, and similar devices must have enclosures as in **(a)** and **(b)** below.

**(a)** Buildings with excessive dust and dust with water must use suitable enclosures.

**(b)** Buildings with a corrosive atmosphere must use suitable enclosures for those conditions.

**(4) Motors and machines.** Motors and other rotating electrical machinery must be totally enclosed or designed to minimize the entrance of dust, moisture, or corrosive particles.

**(5) Lighting fixtures.** Install lighting fixtures to minimize the entrance of dust, foreign matter, moisture and corrosive material.

**(a)** Guard lighting fixtures exposed to physical damage.

**(b)** Lighting fixtures exposed to water must be watertight.

**Stat. Auth.:** ORS 654.025(2) and 656.726(4).

**Stats. Implemented:** ORS 654.001 through 654.295.

**Hist:** OR-OSHA Admin. Order 4-1998, 1/8/28/98, ef. 10/1/98.

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