WAC 296-45-325 Working on or near exposed energized parts. This section applies to work on exposed live parts, or near enough to them, to expose the employee to any hazard they present.

(1) General. Only qualified electrical employees may work on or with exposed energized lines or parts of equipment. Only qualified electrical employees may work in areas containing unguarded, uninsulated energized lines or parts of equipment operating at 50 volts or more. Electric lines and equipment must be considered and treated as energized unless the provisions of WAC 296-45-175 through 296-45-17565 or 296-45-335 have been followed.

(2) Except as provided in subsection (3) of this section, at least two qualified electrical employees must be present while the following types of work are being performed:

(a) Installation, removal, or repair of lines that are energized at more than 600 volts;

(b) Installation, removal, or repair of deenergized lines if an employee is exposed to contact with other parts energized at more than 600 volts;

(c) Installation, removal, or repair of equipment, such as transformers, capacitors, and regulators, if an employee is exposed to contact with parts energized at more than 600 volts;

(d) Work involving the use of mechanical equipment, other than insulated aerial lifts, near parts energized at more than 600 volts; and

(e) Other work that exposes an employee to electrical hazards greater than or equal to those posed by operations that are specifically listed in subsection (2)(a) through (d) of this section.

Notes:
- One qualified electrical employee will serve principally as a standby person who must be so located that they may physically reach the other qualified electrical employee in the event of an accident either with their hand or with a hot stick twelve feet or less in length. The standby person will be so positioned as to be able to observe the other employee, their bodily movements, and verbally warn of any impending dangers. In no case when working in pairs will qualified electrical employees work simultaneously on energized wires or parts of different phases or polarity;
- When installing or removing a hot line clamp connection on a multiphase system, it is permissible for the second qualified electrical employee to stand by at the lower controls of the aerial lift provided the connection or disconnection does not interrupt or pick up the load. The hot line clamp and connecting jumper must be constructed so it cannot make contact with any other energized parts. The work must not be performed above lines or apparatus energized at more than 600 V.
- In cases of necessity the standby person may temporarily assist the other qualified electrical employee provided that they both work on wires or parts of the same phase or polarity. Both qualified electrical employees must so position themselves so that the presence of the second person does not increase the hazard.

(3) The provisions of WAC 296-45-325(2) do not apply to (a) through (e) of this subsection. In addition to the requirements of subsection (4) of this section, a qualified electrical employee working under this subsection (3), must position themselves so that they are neither within reach of nor otherwise exposed to contact with energized parts.

(a) When re-fusing circuits or equipment with a hot stick.

(b) When operating switches by means of operating handle or switch sticks.

(c) When installing or removing a hot line clamp connection with an approved hot stick on a single-phase line or apparatus, providing that the connection or disconnection does not interrupt or pick up a load.

Notes:
- The hot line clamp and connecting jumper must be constructed so that it cannot make contact with any other energized parts.
- On a multiphase feed this applies only when one single-phase line or apparatus is present on the load side.

(d) When installing or removing by hot stick simple load metering devices provided the connection does not interrupt or pickup load.

(e) Emergency repairs to the extent necessary to safeguard the general public.

(4)Minimum approach distances. The employer must ensure that no employee approaches or takes any conductive object closer to exposed energized parts than set forth in Table 2, unless:

(a) The employee is insulated from the energized part (insulating gloves or insulating gloves and sleeves worn in accordance with subsection (6) of this section are considered insulation of the employee only with regard to the energized part upon which work is being performed); or

(b) The energized part is insulated from the employee and from any other conductive object at a different potential;

(c) Appendix A of this chapter contains additional information relating to working on exposed energized parts.

(d) For voltages over 72.5 kilovolts, the employer must determine the maximum anticipated per-unit transient overvoltage, phase-to-ground, through an engineering analysis or assume a maximum anticipated per-unit transient overvoltage, phase-to-ground, in accordance with Table 4 of this section. When the employer uses portable protective gaps to control the maximum transient overvoltage, the value of the maximum anticipated per-unit transient overvoltage, phase-to-ground, must provide for five standard deviations between the statistical spark-over voltage of the gap and the statistical withstand voltage corresponding to the electrical component of the minimum approach distance. The employer must make any engineering analysis conducted to determine maximum anticipated per-unit transient overvoltage available upon request to employees and to the department for examination and copying.

Table 2
AC Live Work Minimum Approach Distance

	Distance to Employee					
Voltage in Kilovolts Phase-to-Phase	**Phase-to-Ground**			**Phase-to-Phase**		
	(ft-in)	**(ft-1/10)**	**(m)**	**(ft-in)**	**(ft-1/10)**	**(m)**
Table 2-A For Voltages of 72.5 KV and Less ([1,2,3,4])						
0 to 0.050	not specified			not specified		
0.051 to 0.300	avoid contact			avoid contact		
0.301 to 0.750	1'-2"	1.09	0.33	1'-2"	1.09	0.33
0.751 to 5	2'-1"	2.07	0.63	2'-1"	2.07	0.63
5.1 to 15.0	2'-2"	2.14	0.65	2'-3"	2.24	0.68
15.1 to 36.0	2'-7"	2.53	0.77	3'-0"	2.92	0.89
36.1 to 46.0	2'-10"	2.76	0.84	3'-3"	3.22	0.98
46.1 to 72.5	3'-3"	3.29	1.00	4'-0"	3.94	1.20
[1]Employers may use the minimum approach distances in this table provided the worksite is at an elevation of 3,000 feet (900 meters) or less. If employees will be working at elevations greater than 3,000 feet (900 meters) above mean sea level, the employer must determine minimum approach distances by multiplying the distances in this table by the correction factor in Table 3 below, altitude correction factors.						
[2]For single-phase systems, use voltage-to-ground.						
[3]For single-phase lines off three phase systems, use the phase-to-phase voltage of the system.						
[4]The 46.1 to 72.5 kV phase-to-ground 3-3 distance contains a 1-3 electrical component and a 2'-0 inadvertent movement component.						
Table 2-B For Voltages of 72.6 KV and up ([5,6,7])	**Phase-to-Ground**			**Phase-to-Phase**		
	(ft-in)	**(ft-1/10)**	**(m)**	**(ft-in)**	**(ft-1/10)**	**(m)**
72.6 to 121	3'-9"**	3.71**	1.13	4'-8"	4.66	1.42

Voltage in Kilovolts Phase-to-Phase	Distance to Employee					
	Phase-to-Ground			Phase-to-Phase		
	(ft-in)	(ft-1/10)	(m)	(ft-in)	(ft-1/10)	(m)
121.1 to 145.0	4'-4"	4.27	1.30	5'-5"	5.38	1.64
145.1 to 169.0	4'-10"	4.79	1.46	6'-5"	6.36	1.94
169.1 to 242.0	6'-8"	6.59	2.01	10'-2"	10.10	3.08
242.1 to 362.0	11'-3"	11.19	3.41	18'-2"	18.11	5.52
362.1 to 420.0	14'-0"	13.94	4.25	22'-5"	22.34	6.81
420.1 to 550.0	16'-8"	16.63	5.07	27'-1"	27.03	8.24
550.1 to 800.0	22'-7"	22.57	6.88	37'-5"	37.34	11.38

[5]Employers may use the minimum approach distances in this table provided the worksite is at an elevation of 3,000 feet (900 meters) or less. If employees will be working at elevations greater than 3,000 feet (900 meters) above mean sea level, the employer shall determine minimum approach distances by multiplying the distances in this table by the correction factor in Table 3 below, altitude corrections factor.

[6]Employers may use the phase-to-phase minimum approach distances in this table provided that no insulated tool spans the gap and no large conductive object is in the gap. (See Equation 1 for voltages of 72.6-800 kV in Appendix A.)

[7]The 72.6 to 121 kV phase-to-ground 3-9 distance contains a 2-9 electrical component and a 1'-0 inadvertent movement component.**

Note: The clear live-line tool distance shall equal or exceed the values for the indicated voltage ranges.

Table 3 – Altitude Correction Factors

Altitude above sea level (m)	*A*
0 to 900	1.00
901 to 1,200	1.02
1,201 to 1,500	1.05
1,501 to 1,800	1.08
1,801 to 2,100	1.11
2,101 to 2,400	1.14
2,401 to 2,700	1.17
2,701 to 3,000	1.20
3,001 to 3,600	1.25
3,601 to 4,200	1.30
4,201 to 4,800	1.35
4,801 to 5,400	1.39
5,401 to 6,000	1.44

Table 4 Assumed Maximum Per-Unit Transient Overvoltage

Voltage Range (kV)	Type of Current (ac or dc)	Assumed Maximum Per-Unit Transient Overvoltage
72.6 to 420.0	ac	3.5
420.1 to 550.0	ac	3.0
550.1 to 800.0	ac	2.5
250 to 750	dc	1.8

Notes:
- WAC 296-45-475 (5)(a) and 296-45-48525(1) contain requirements for the guarding and isolation of live parts. Parts of electric circuits that meet these two provisions are not considered as "exposed" unless a guard is removed or an employee enters the space intended to provide isolation from the live parts.
- When an employee is required to work on or within reach of any unprotected conductors that are or may become energized at more than 50 volts and less than 600 volts between phases, they shall take the following precautions:
  - They shall wear approved insulating gloves or insulating gloves and sleeves during the time they are working on such conductor; or
  - They shall cover, with approved devices, any adjacent unprotected conductor that could be touched by any part of their body, and use insulated tools.
  - Cables which are properly insulated for the voltages to which they are energized, shall be considered as an effective barrier to protect the employees and Table 2 need not apply.
- Appendix A of this chapter contains additional information relating to working on exposed energized parts.

(5) Initial determination.

(a) Before any work is performed, the location of energized lines and their condition, the location and condition of energized equipment, the condition of the poles, the location of circuits and equipment including power communication lines, CATV and fire alarm circuits, must be determined and communicated to employees as will any other particular hazard of a particular work site.

(b) No work must be performed on energized lines or parts until the voltage of such equipment and lines is determined.

(6) Type of insulation. If the employee is to be insulated from energized parts by the use of insulating gloves (under subsection (4) of this section), insulating sleeves must also be used. However, insulating sleeves need not be used under the following conditions:

(a) If exposed energized parts on which work is not being performed are insulated from the employee; and

(b) If such insulation is placed from a position not exposing the employee's upper arm to contact with other energized parts.

(7) Working position. The employer must ensure that each employee, to the extent that other safety-related conditions at the worksite permit, works in a position from which a slip or shock will not bring the employee's body into contact with exposed, uninsulated parts energized at a potential different from the employee.

(8) Making connections. The employer must ensure that connections are made as follows:

(a) In connecting deenergized equipment or lines to an energized circuit by means of a conducting wire or device, an employee must first attach the wire to the deenergized part;

(b) When disconnecting equipment or lines from an energized circuit by means of a conducting wire or device, an employee must remove the source end first; and

(c) When lines or equipment are connected to or disconnected from energized circuits, loose conductors must be kept away from exposed energized parts.

(9) Rubber gloves can only be used on 5,000 volts or less between phases.

(10) It must not be permissible to consider one part of a high voltage switch or disconnect as deenergized for the purpose of doing work on it if the remainder of the switch or disconnect remains energized unless approved barriers are erected which will prevent employees who are doing the work on such equipment from coming in direct contact with the energized parts.

(11) Conductor support tools such as link sticks, strain carriers, and insulator cradles may be used: Provided, That the clear insulation is at least as long as the insulator string or the minimum distance specified in Table 2 for the operating voltage.

(12) Apparel.

(a) When work is performed within reaching distance of exposed energized parts of equipment, the employer must ensure that each employee removes or renders nonconductive all exposed conductive arti-

cles, such as key or watch chains, rings, or wrist watches or bands, unless such articles do not increase the hazards associated with contact with the energized parts.

(b) Employees must wear clothing appropriate to the season and the kind of work being performed. Shirts or jumpers must have full length sleeves that are rolled down. Protective hard hats and eye protection must be worn when working on or near live parts or while climbing poles.

(13) Protection from flames and electric arcs.

(a) The employer must assess the workplace to identify employees exposed to hazards from flames or from electric arcs.

(b) For each employee exposed to hazards from electric arcs, the employer must make a reasonable estimate of the incident heat energy to which the employee would be exposed.

Notes:
- Appendix D of this chapter provides guidance on estimating available heat energy. The department will deem employers following the guidance in Appendix D to be in compliance with (b) of this subsection. An employer may choose a method of calculating incident heat energy not included in Appendix D if the chosen method reasonably predicts the incident energy to which the employee would be exposed.
- This subsection does not require the employer to estimate the incident heat energy exposure for every job task performed by each employee. The employer may make broad estimates that cover multiple system areas provided the employer uses reasonable assumptions about the energy-exposure distribution throughout the system and provided the estimates represent the maximum employee exposure for those areas. For example, the employer could estimate the heat energy just outside a substation feeding a radial distribution system and use that estimate for all jobs performed on that radial system.

(c) The employer must ensure that each employee who is exposed to hazards from flames or electric arcs does not wear clothing that could melt onto their skin or that could ignite and continue to burn when exposed to flames or the heat energy estimated under (b) of this subsection.

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

(d) The employer must ensure that the outer layer of clothing worn by an employee, except for clothing not required to be arc rated under (e)(i) through (v) of this subsection, is flame resistant under any of the following conditions:

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

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

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

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

(iv) The incident heat energy estimated under (b) of this subsection exceeds 2.0 cal/cm^2.

(e) The employer must ensure that each employee exposed to hazards from electric arcs wears protective clothing and other protective equipment with an arc rating greater than or equal to the heat energy estimated under (b) of this subsection whenever that estimate exceeds 2.0 cal/cm^2. This protective equipment must cover the employee's entire body, except as follows:

(i) Arc-rated protection is not necessary for the employee's hands when the employee is wearing rubber insulating gloves with protectors or, if the estimated incident energy is no more than 14 cal/cm^2, heavy-duty leather work gloves with a weight of at least 407 gm/m^2 (12 oz/yd^2);

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

(iii) Arc-rated protection is not necessary for the employee's head when the employee is wearing head protection meeting WAC 296-800-16055 if the estimated incident energy is less than 9 cal/cm^2 for exposures involving single-phase arcs in open air or 5 cal/cm^2 for other exposures;

(iv) The protection for the employee's head may consist of head protection meeting WAC 296-800-16055 and a faceshield with a minimum arc rating of 8 cal/cm^2 if the estimated incident-energy exposure is less than 13 cal/cm^2 for exposures involving single-phase arcs in open air or 9 cal/cm^2 for other exposures; and

(v) For exposures involving singlephase arcs in open air, the arc rating for the employee's head and face protection may be 4 cal/cm^2 less than the estimated incident energy.

Note: See Appendix D of this chapter for further information on the selection of appropriate protection.

(14) Fuse handling. When fuses must be installed or removed with one or both terminals energized at more than 300 volts or with exposed parts energized at more than 50 volts, the employer must ensure that tools or gloves rated for the voltage are used. When expulsion-type fuses are installed with one or both terminals energized at more than 300 volts, the employer must ensure that each employee wears eye protection meeting the requirements of WAC 296-45-25505(1), uses a tool rated for the voltage, and is clear of the exhaust path of the fuse barrel.

(15) Covered (noninsulated) conductors. The requirements of this section which pertain to the hazards of exposed live parts also apply when work is performed in the proximity of covered (noninsulated) wires.

(16) Noncurrent-carrying metal parts. Noncurrent-carrying metal parts of equipment or devices, such as transformer cases and circuit breaker housings, must be treated as energized at the highest voltage to which they are exposed, unless the employer inspects the installation and determines that these parts are grounded before work is performed.

(17) Opening circuits under load. Devices used to open circuits under load conditions must be designed to interrupt the current involved.

[Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060 and chapter 49.17 RCW. WSR 19-13-083, § 296-45-325, filed 6/18/19, effective 8/1/19; WSR 16-10-082, § 296-45-325, filed 5/3/16, effective 7/1/16. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. WSR 05-17-038, § 296-45-325, filed 8/9/05, effective 10/1/05; WSR 03-17-071, § 296-45-325, filed 8/19/03, effective 11/1/03. Statutory Authority: RCW 49.17.040. WSR 99-09-080, § 296-45-325, filed 4/20/99, effective 8/1/99. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. WSR 98-07-009, § 296-45-325, filed 3/6/98, effective 5/6/98.]