



# **BONNEVILLE POWER ADMINISTRATION**

## **Contractor Safety and Health Requirements For Prime and Subcontractors**

Effective Date: *October 26, 2016*

Version: 2.1

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## **CHAPTER 1 – GENERAL REQUIREMENTS – APPLICABLE TO ALL BPA PROJECTS**

This document contains the safety requirements of Clause 15-13, Contractor Safety and Health Requirements. Chapter 1, General Requirements, applies to ALL work, whereas Chapters 2 through 5 is specific to the types of work required by the following documents:

- Statement of Work
- Technical Specification, and/or
- The Contractor's Technical Work Plan

The Contractor shall ensure that all workers, subcontractors, and suppliers comply with the requirements of this safety document.

### **1. General**

1.1. The Contractor shall furnish to each employee employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to employees; and shall comply with occupational safety and health standards promulgated under the Occupational Safety and Health Act of 1970. Each contractor employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to their own actions and conduct. In fulfilling these requirements, the Contractor shall comply with:

1.1.1. Department of Labor Safety and Health Standards for Construction under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3701 et seq.).

1.1.2. All non-construction contractors shall comply with the general industry standards issued by the Secretary of Labor at 29 CFR Part 1910 Occupational Safety and Health Standards or equivalent OSHA State plan standards.

1.1.3. All construction contractors shall comply with 29 CFR Part 1926 Safety and Health Regulations for Construction or equivalent OSHA State plan standards.

1.1.4. All Federal and State safety and health rules and regulations applicable to the contract work, as supplemented by BPA Work Standards, Manufacturer Instructions, and safety and health requirements stated below or elsewhere in the contract. If there are conflicts between any of the requirements referenced in this contract, the more stringent requirement shall prevail.

1.2. Stopping Work for Health and Safety

1.2.1. Initial Notice: If the Contractor fails or refuses to immediately comply with any safety or health requirement, any BPA employee may notify the Contractor of any safety and health concerns. The notice may be in writing or oral. The notice may be delivered to any contractor employee or a subcontractor. The notice shall have the same effect on the contractor regardless of format or recipient. The Contractor shall take immediate action to mitigate the safety and health concerns identified in BPA's notice. BPA employees have authority to immediately stop a work activity without issuing an initial notice, refer to 1.2.2.

- 1.2.2. Stopping a Work Activity: BPA employees may direct the contractor to stop a work activity due to safety and health concerns. The BPA employee shall notify the Contractor orally with written confirmation, and request immediate initiation of corrective action. After receipt of the notice the Contractor shall immediately take corrective action to eliminate or mitigate the safety and health concern. When a BPA employee stops a work activity due to a safety and health concern the Contractor shall immediately notify the Contracting Officer (CO), provide a description of the event, and identify the BPA employee that halted the work activity. The Contractor shall not resume the stopped work activity until authorization to resume work is recommended by the BPA Safety Office Organization and issued by the CO.
- 1.2.3. Stop Work Order: The CO may direct the contractor to Stop Work due to safety and health concerns in addition to reasons described in Clause 14-14. The CO's Stop Work Order may cover all work on the contract or only a portion of the work. After the CO issues a Stop Work Order for a safety and health concern the Contractor shall meet with representatives of BPA's Contracting Office and the BPA Safety Office Organization to present a written statement outlining specific changes the contractor will make to the work procedures to improve safety. A Stop Work Order issued for safety and health concerns will not be rescinded without approval by the CO and the BPA Safety Office Organization. Refer to Clause 14-14 Stop Work Order.
- 1.2.4. The Contractor shall not be entitled to any equitable adjustment of the contract price or extension of the performance schedule when BPA stops a work activity due to safety and health concerns that occurred under the contractor's control. Refer to clause 15-12 Contractor Safety and Health for additional information for stopping a work activity and 14-14 for Stop Work Orders.
- 1.2.5. BPA's conduct does not alter or waive the contractor's safety and health obligations established in Clause 15-12.
- 1.3. The Contractor shall maintain an accurate record of, and shall immediately report to the Contracting Officers Technical Representative (COTR) or onsite BPA Representative in the manner prescribed, all cases of death, injury, occupational diseases, and near misses arising from, or incident to, performance of work under this contract. The record and report shall include a description of the preventative measures to be taken to avoid recurrence, any restitution or settlement made, or the status thereof. The Contractor shall complete and file with the BPA Safety Office Organization through the COTR, BPA form 6410.15e (Contractor's Report of Personal Injury, Illness, or Property Damage Accident) within five (5) working days of such an occurrence. In the case of a Near Miss Incident that does not involve injury, illness, or property damage, the Contractor shall complete and file with the BPA Safety Office Organization through the COTR, BPA Form 6410.18e (Contractor's Report of Incident/Near Miss) within five (5) working days of such an occurrence. The Contractor shall submit with the reports applicable photographs and witness statements.
- 1.4. All cases of death, serious incidents, injuries or other incidents as determined by the CO in consultation with the BPA Chief Safety Officer shall be investigated by the Contractor to identify all causes and to recommend hazard control measures. A written report shall be submitted to BPA within 30 days of the occurrence.
  - 1.4.1. In the event of a serious incident, injury or fatality the immediate group shall stand down and stop work. The contractor shall secure the scene from change until released by the CO in consultation with the BPA Chief Safety

Officer. The Contractor shall collect statements of the crew/witnesses as soon as practical.

- 1.4.2. BPA reserves the right to perform an incident investigation in parallel with the Contractor. The Contractor and their workers shall cooperate fully with BPA in their investigation. Contractors are required to provide BPA a summary of the medical injuries, including if applicable the cause of death and any additional information on the workers' physical capabilities/readiness level to perform the work.

#### 1.5. Notification of Imminent Danger and Workers Right to Decline Work

- 1.5.1. All workers, including contractors, and BPA employees, are responsible for identifying and notifying other workers in the affected area of imminent danger at the site of work. Imminent danger is any condition or practice that poses a danger that could reasonably be expected to cause death or severe physical hardship before the imminence of such danger could be eliminated through normal procedures. Contract workers have the right to ask, without reprisal, their onsite management and other workers to review safe work procedures and consider other alternatives before proceeding with a work procedure.
- 1.5.2. Workers have the right to decline to perform tasks or call for a temporary stand-down, without reprisal, that they believe will endanger their safety and health and the safety and health of other workers. Clause 15-12 Contractor Safety and Health requires Contractors to establish procedures that allow workers to cease or decline to partake in work that may threaten the safety and health of the worker. Reprisal means any action taken against an employee in response to, or in revenge for, the employee having raised, in good faith, reasonable concerns about a safety and health aspect of the work required by the contract.

## 2. Site Specific Safety Plan

- 2.1. The Contractor shall prepare, implement, and enforce a Site Specific Safety Plan (SSSP) or Job Hazard Analysis (JHA) for each contract or release. JHA's are required for Commercial Aviation Services (CAS); CAS shall also comply with the additional requirements in Chapter 4 of this document. JHA's are also required for Access Road and Vegetation Management Work, and other project work if specifically authorized by the BPA Safety Organization. SSSP's are required for all other construction work, and other project work if requested by the BPA Safety Organization.
- 2.2. When performing CAS external load work, the Contractor shall submit for review by BPA's Aircraft Services at least ten (10) business days in advance of any proposed flight operations:
  - 2.2.1. A job specific Job Hazard Analysis (JHA) that shall include hazard mitigations for the specific type of structures and work to be performed. When working in energized corridors or double circuit structures where a circuit remains energized, the JHA shall detail specific procedures to assure that the applicable Minimum Approach Distance (MAD) is maintained by the helicopter and all attachments including a procedure to account for wind and other conditions.

- 2.2.2. When a congested area plan is required by FAR 133: Rotorcraft External-load Operations, the Contractor shall be responsible for preparation and submittal for approval to the Federal Aviation Administration (FAA) in advance of the lift. A copy shall be available to BPA Aircraft Services at their request.
  - 2.3. Prior to the start of any on-site work for each contract or release, the Contractor shall:
    - 2.3.1. Provide a SSSP or a JHA to identify and mitigate any recognized hazards or conditions. Site and adjacent conditions shall be considered. All significant hazards shall be identified. Unusual or unique hazards or conditions specific to the contract or release, known by BPA, will be identified in the technical specification. The contractor shall also provide a clear delegation of authority for the work site(s). The delegation of authority shall include a list that includes the names and contact information for all key site and office personnel assigned to the project. The list of contacts will be included in the body of the SSSP, and updated throughout the course of the project.
    - 2.3.2. Submit to BPA a copy of the SSSP or JHA at least ten (10) business days prior to start of on-site work. If the BPA Safety Office Organization determines the SSSP or JHA to be insufficient, they may stop the Contractor's right to start with any or all on site work.
    - 2.3.3. The contractor shall make available to all workers at the work site the SSSP or JHA. All workers must be familiar with its content and the content of the Site Specific Safety Plan or Job Hazard Analysis. The Site Specific Safety Plan or Job Hazard Analysis SSSP/JHA shall be available for review by BPA employees upon request.
  - 2.4. The Contractor shall ensure that their subcontractors, suppliers, and support personnel follow all safety and health provisions and that all personnel working on the project are knowledgeable of the provisions of the plan.

### **3. Access Roads**

- 3.1. The Contractor shall prepare, implement and enforce a JHA for each Master Contract or Master Award upon request. For Access road work with High-Hazard work activities, a JHA will be implemented and may be supplemented with a separate SSSP which addresses the High-hazard work areas.
- 3.2. The JHA describes the potential hazards encountered in access road work, along with the Contractor policies; controls, work practices, and personal protective equipment (PPE) selected to minimize those hazards. A SSSP shall be required in cases where the work is outside the normal scope of Access Road work and in cases where identified high-hazard work tasks or blasting is necessary.
- 3.3. Equipment, machinery, and vehicle's traveling on BPA's right-of-way shall come no closer than 25 feet to any BPA transmission line structure or guy wires.
  - 3.3.1. If work is required in close proximity to guy wires they shall be flagged before work commences.
  - 3.3.2. Spotters shall be used to maintain safe work distances from structures.
- 3.4. Counterpoise



- 3.4.1. There may be buried counterpoise (a mini-ground mat) associated with the structures, and the contractor shall avoid cutting the counterpoise.
- 3.4.2. If the counterpoise is compromised in any way, the Contractor shall immediately notify the COTR, or onsite BPA Representative.

#### **4. Blasting**

- 4.1. When blasting is required on the project, the Contractor shall submit a Site Specific blasting plan as directed in Construction Technical Transmission Line and Fiber Optic Cable Master Specification Section division 01 35 726.
- 4.2. When blasting is used, comply with Clause 24-23, Use of Explosives.

#### **5. Communications**

- 5.1. The Contractor shall ensure that field supervision maintains a reliable method of emergency communications from all right-of-way work areas in the event of accident or illness. The Contractor shall conduct communication checks/tests to ensure quality of communications with emergency personnel.

#### **6. Confined Spaces**

- 6.1. The Contractor shall identify any needed or required worker entry into a confined space as defined by Federal OSHA Standards 1926.1200 or 1910.146 and/or any applicable State standard or regulation.
- 6.2. The Contractor shall identify any permit required for confined space entry and implement a confined space entry program as required by OSHA 1926.1200 or 1910.146 and/or any applicable State standard or regulation.
- 6.3. The Contractor shall monitor for hazardous atmosphere before and during any worker entry into an identified or suspected confined space.

#### **7. Emergency Action Plan**

- 7.1. The Contractor shall identify, locate and provide directions to the nearest emergency medical facilities. This shall include phone numbers for emergency services in the area.
- 7.2. Many BPA Facilities have an Occupant Emergency Plan (OEP). Each occupant must be aware of and familiar with the OEP. Contractors must familiarize themselves with these plans. Plans may be obtained from the CO or BPA District Manager.

#### **8. Energized Facilities and Communication Sites**

- 8.1. Rules and requirements governing the issuance of Permits and the entry into, movement within and exit are defined in BPA's Rules of Conduct Handbook (ROCH). Contractors shall comply with these requirements
  - 8.1.1. All Contractor workers must obtain Non-Electrical Worker, Restricted Electrical Worker or Electrical Worker permits (as applicable), for unescorted entry to BPA energized substations, or be escorted at all times as indicated in the ROCH.



- 8.1.1.1. The Contractor shall provide for the safety of the workers and shall at all times, take necessary precautions to protect BPA's facilities from accidental contact that could cause an injury, outage, or damage to the facility. At no time will any non-qualified worker (a worker not meeting the requirements defined in section 23), or equipment come closer to energized lines or equipment than the Limited Approach Boundary (LAB) in Table 1.
- 8.2. The Contractor shall, as directed by the COTR after consultation with a BPA Qualified Electrical Employee, erect, maintain, and remove such safety fences as are required to prevent accidental contact between BPA's normally energized facilities and the Contractor's equipment or workers. BPA will normally furnish the safety fences required in its energized substation yards or communication equipment sites. The safety fences shall not be removed without consent of the COTR after consultation with a BPA Qualified Electrical Employee. Safety fences furnished by BPA remain the property of BPA.
- 8.3. Contractor workers shall not cross red and white or yellow and black ropes. These are used by BPA to designate electrical hazards.
- 8.4. Entry into, exit out of, and movement within a communication site and energized facility by a non-permitted person requires an escort. Escorts must hold a permit which would allow them to perform the work being performed by the person being escorted. The Contractor shall discuss the specific use of escorts as a part of the SSSP. State if multiple escorts are required, and state any instances where there is intent to utilize Safety Watchers for escorting purposes. Safety watchers may not provide escort work if they are actively involved in Safety Watcher duties. The Safety Watcher may request an additional Safety Watcher if workload demands dictate.
- 8.5. Whenever a worker enters energized facilities or communication equipment sites, or whenever work is otherwise in proximity to BPA's normally-energized transmission facilities, the Contractor shall provide for the safety of the workers and shall at all times take necessary precautions to protect BPA facilities from accidental contact that could cause an outage, or damage the facility. At no time will any non-qualified worker (a worker not meeting the requirements defined in section 23) or equipment come closer to energized lines or equipment than the Limited Approach Boundary (LAB) in Table 1.
- 8.6. The Contractor shall, as directed by the COTR, or the onsite BPA Representative, after consultation with a BPA Qualified Electrical Worker, erect, maintain, and remove such safety fences as are required to prevent accidental contact between BPA's normally energized facilities and the Contractor's equipment or workers. BPA will normally furnish the safety fences required in its energized facilities or communication equipment sites. The safety fences shall not be removed without consent of the COTR, or the onsite BPA Representative, after consultation with a BPA Qualified Electrical Worker. Safety fences furnished by BPA remain the property of BPA.
- 8.7. Contractors using generators or station service to power portable electric tools in energized facilities must use grounding boxes (BPA "eartha-kits") to minimize step and touch hazards. The cord's grounding box must be clamped to a solidly grounded fixture before the extension cord is connected to a switchyard receptacle or a generator. If a solidly grounded fixture is not available within ten (10) feet of the worksite, the grounding box shall be attached to a ground rod. When using double insulated tools, work may be done within 25 feet of the grounding box. Station service may not be used for temporary power off the ground grid. As an alternative, when working off the ground grid, Contractors may use generators for portable power.

- 8.8. All work shall take place entirely on or entirely off the ground grid to avoid the hazards of transferred potential. If it is unavoidable for a work procedure to take place simultaneously on and off the grid (such as using a crane, pulling cable and directional boring work), the COTR or the onsite BPA Representative must be consulted for specific methods that would minimize the hazard.

8.9. Utility Locates: All Utility Locates are the responsibility of the Contractor. Utility Locates will occur prior to any excavations, trenching or penetrations of building structures. This includes:

8.9.1. Underground utilities of all types.

8.9.2. Substation Grounding Grids (around the perimeter of and underneath substations).

8.9.3. Telecommunication Tower Grounding Rings (buried beneath the towers).

8.9.4. Counterpoise (smaller ground mats located at the base of electrical transmission towers).

8.9.5. Utilities inside and below BPA facilities. This includes utilities concealed in floors, walls, ceilings, and crawl spaces.

Reference: Please see Substation Maintenance Standards and Guides SM-STD-13-1-5, *Grounding, Precautions when Contacting the Substation Ground Grid and Grounding Work Equipment and Vehicles in Substations*, SM-STD-13-1-15.

## 8.10. Arc Flash Hazards

- 8.10.1. Arc flash personal protective clothing and equipment appropriate for the hazard/risk category shall be utilized in accordance with OSHA 1910.269, NFPA 70E and/or BPA provided arc flash studies (if applicable).
- 8.10.2. For entry into energized facilities or communication sites, all Contractors shall wear arc-rated clothing (long-sleeved shirts and pants or coveralls) with a minimum rating of 8 cal/cm<sup>2</sup>. In addition to the requirements in 17.2, boots shall have leather uppers. Note: This requirement is a minimum clothing requisite that does not provide an overall 8 cal/cm<sup>2</sup> protection. Additional PPE may be required based on the hazard.
- 8.10.3. Exemption: For short-term duration activities (e.g., material delivery and removal, testing agency activities, sanitary workers, etc.), the Contractor may request an exemption by specifying the work activity in detail in the Contractors Site Specific Safety Plan (SSSP). For example, if the Contractor can ensure that activities by non-permitted persons will not result in an exposure to an arc event at or above 1.2 cal/cm<sup>2</sup>, arc-rated clothing will not be required for the non-permitted person. For unanticipated short term activities, the Contractor shall furnish their visitors with coveralls with an 8 cal/cm<sup>2</sup> rating. Exempted activities must be performed under the escort of a permitted restricted electrical worker or above.
- 8.10.4. Electrical work shall be performed in an electrically safe condition (i.e., deenergized or worked outside the shock and arc flash boundary). The Contractor may request an exemption from this requirement by demonstrating that no other method is possible by completing a Contractor Energized Electrical Work Permit (CEEWP).
  - 8.10.4.1. Prior to the start of any job requiring a CEEWP, the permit will need to be signed and conveyed to the COTR prior to the start of work.
  - 8.10.4.2. The following work activities require a CEEWP:
    - 8.10.4.2.1. Any work on circuits greater than 240 volts;
    - 8.10.4.2.2. Any work on 3-phase circuits;
    - 8.10.4.2.3. Any circuit labeled as requiring greater than 8 calorie arc flash rated personal protective equipment.
  - 8.10.4.3. The contractor will use the BPA Contractor Energized Electrical Work Permit (BPA F 6410.42), following instructions attached to the form. The form will not be considered complete until the BPA COTR, Management Representative, District Engineer and/or Substation Operations Representative have reviewed and signed their sections of the form.
  - 8.10.4.4. During the duration of the work covered by the CEEWP, the contractor will prominently display the permit where it will be visible prior to entering the work zone.
  - 8.10.4.5. If, during the course of the work, an unlabeled panel is discovered, the contractor shall:

- 8.10.4.5.1. Immediately stop work;
- 8.10.4.5.2. Notify the COTR for consultation with a BPA Qualified Electrical Worker and/or BPA Engineering;
- 8.10.4.5.3. Proceed only after the appropriate calorie rating has been clearly identified and if applicable, the CEEWP has been updated.
- 8.10.5. Alerting techniques are required to ensure the safety of unqualified individuals who may be in the vicinity of work that involves a shock or arc flash hazard.
- 8.10.6. Safety Signs and Tags. Safety signs, safety symbols, or accident prevention tags shall be used where necessary to warn workers about electrical hazards that might exist. Such signs and tags shall meet the requirements of ANSI Z535.
- 8.10.7. Barricades. Barricades shall be used in conjunction with safety signs where it is necessary to prevent or limit worker access to areas containing energized conductors or circuit parts. Conductive barricades shall not be used where it might increase the likelihood of exposure to an electrical hazard. Comparison must be made between the limited approach boundary listed in Table 4.1 and the arc flash boundary. Barricades shall be placed no closer than the greater of these two distances to ensure protection from shock and arc flash hazards.
- 8.10.8. Attendants. If signs and barricades do not provide sufficient warning and protection from electrical hazards, an attendant shall be stationed to warn and protect workers. The primary duty and responsibility of an attendant providing manual signaling and alerting shall be to keep unqualified individuals outside a work area where the unqualified individual might be exposed to electrical hazards. An attendant shall remain in the area as long as there is a potential for workers to be exposed to the electrical hazards.
- 8.10.9. Look-Alike Equipment. Work may be performed on equipment that is de-energized and placed in an electrically safe work condition while other energized equipment of similar size, shape, and construction is located in the same vicinity. When this situation exists, safety signs and tags, barricades, and/or attendants shall be used to prevent workers from entering look-alike equipment. It should be noted that these methods do not relieve the worker of accurate equipment verification.
- 8.10.10. Arc flash personal protective equipment appropriate for the hazard/risk category shall be utilized.
- 8.10.11. Electrical panels that are not labeled with the arc flash rating shall be worked in an electrically safe condition.
- 8.11. Batteries, and Chargers and Capacitors
  - 8.11.1. All battery work shall be performed in accordance with BPA Work Standard BPA-WS-9-2, Manufacturer Instructions, and/or any applicable Federal, State standard or regulation.

## 8.12. Capacitors

- 8.12.1. The internal resistor of a capacitor cell shall not be depended upon to discharge capacitors. A bayonet-type short circuiting and grounding rod shall be applied, for at least 5 seconds, between all insulated terminals and the capacitor case before handling. Cells removed, stored or transported shall be shorted between all insulated terminals and the capacitor case with at least a No. 18 AWG wire.

## 8.13. Conductive Devices

- 8.13.1. Portable metal ladders are not permitted in energized facilities.
- 8.13.2. Conductive objects such as metal tapes, surveyor chains, fish tapes, and center line may be used in energized facilities only when specifically approved by the Qualified Electrical Worker that holds a BPA Electrical Worker Permit and restrained by adequate methods, to prevent electrical contact in the event of slippage or breakage at any point.

## 8.14. Electrical Contact Protocol

- 8.14.1. Any worker experiencing an electrical shock of any type shall be transported to the nearest emergency medical facility as soon as possible. Refer to the BPA Electrical Contact Protocol for guidance.
- 8.14.2. In case of electrical shock, contacting one of the Electrical Burn Centers that specialize in electrical shock accidents is advised. Even in apparently minor electrical injuries, consulting with the closest Regional Burn Center regarding treatment is recommended. The Regional Burn Centers are:
  - **Legacy Emanuel Medical Center (Portland, OR)** – (888) 598-4232
  - **Harborview Medical Center (Seattle, WA)** – (888) 731-4791
  - **Intermountain Burn Center – University of Utah (Salt Lake City, UT)** – (801) 581-2700

## 8.15. Ground Grid

Noted Exception: At BPA radio stations, the installation of ground grids and any connections to the ground grid are not considered electrical work. The contractor shall have experience installing lightning protection ground grids and shall be adequately trained and familiar with the safety-related work practices involved with such installations.

- 8.15.1. Lightning Work Curtailment Criteria: Work shall be suspended and personnel shall seek a safe haven during times that local or close-in lightning is within sight or sound, and remain in the clear for thirty minutes after the last flash of lightning is seen or thunder is heard. Grounding of Equipment
- 8.15.2. Aerial lifts, cranes, booms, and any other equipment working in proximity to energized lines or equipment where there is a possibility of accidental contact shall be connected to the substation ground grid within energized switchyards or to a ground rod in other locations with 2/0 copper ground.

8.15.3. Multiple (parallel) ground leads may be required at some locations on the BPA power system when the anticipated fault current exceeds the capacity of a single 2/0 copper ground. These locations (if applicable) will be provided by BPA in the contract technical specifications.

8.16. Identification of Circuits

8.16.1. No work shall be performed on any circuit until positive identification of all electrical circuits in the work area has been established.

8.17. Minimum Approach Distance (MAD)

8.17.1. No part of a worker's body or any conductive object held by a worker shall be moved closer to energized high voltage parts than the applicable Minimum Approach Distance (MAD) unless an approved barrier is in place.

8.17.2. When work is to be performed within the MAD, including the installation and removal of barriers, one of the following must be employed:

- Approved barriers
- Use of live-line tools
- Clearance
- Lockout/Tagout (on voltages 600V and below)

8.17.3. Conductive objects, such as insulator support hardware, which extend into the MAD, may be contacted outside the applicable MAD. However, such objects must have been installed with approved design standards and be fixed or limited in movement so that the designed clearances cannot be reduced.

8.17.4. Only persons qualified and trained to perform work safely on or in close proximity to energized lines and equipment shall be allowed to work or operate equipment up to the applicable MAD. Non-qualified workers approaching normally energized equipment shall not enter within the distances listed in Table 1, either on foot or in a vehicle, unless given the following information by a Qualified Electrical Worker\*:

- Procedure for identifying energized equipment
- Voltage(s) and how to identify voltage level of specific equipment.
- Minimum Approach Distance(s)
- Hazards associated with violation of MAD

\* In Energized Facilities this information must be given by a Qualified Electrical Worker that holds a BPA Electrical Worker Permit. [Note: Refer to section 8.4 of the BPA Rules of Conduct Handbook]

8.17.5. TABLE 1 – Limited Approach Boundary (LAB) for Non-Qualified Workers

<b>Table 1: Limited Approach Boundary for Non-Qualified Workers – All Elevations</b>	
<b>Nominal System Voltage (kV)</b>	<b>Phase-Ground (ft-in)</b>
50 V to 69 kV	10'-0"
69.1 kV to 345 kV	15'-0"
Above 345 kV	20'-0"
Energized ground wire – (Airway lighting & PCS up to 14.4 kV)	15'-0"
Insulated Overhead Ground Wire	10'-0"
Fiber Optic Ground Wire (OPGW)	10'-0"

8.17.6. TABLE 2 – Minimum Approach Distance (MAD) for Vehicles and Equipment

<b>Table 2 MAD for Vehicles and Equipment – All Elevations</b>	
<b>Nominal Voltage Phase-to-Phase</b>	<b>MAD (ft-in) Phase-to-Ground</b>
Up to 345 kV	15'-0"
500 kV AC	20'-0"
ALL DC Facilities	20'-0"

- 8.17.6.1. All workers must utilize a safety watcher when operating mechanical equipment that could encroach on the applicable MAD distance.
- 8.17.6.2. In substations, all non-qualified persons and persons holding an Access Permit shall not drive vehicles or operate mechanical equipment unless under the direction and observation of a Safety Watcher. Persons holding a Restricted Electrical Worker or a Non-Electrical Worker Permit driving vehicles or operating mechanical equipment must maintain 15 foot distance from all energized circuits up to 345 kV and 20 foot distance from all circuits above 345 kV unless under the direction and observation of a safety watcher. Persons holding an Electrical Worker Permit may drive motor vehicles or operate mechanical equipment near energized facilities as long as the applicable MAD is maintained. Refer to BPA WS 5-1 Minimum Approach Distance (MAD) Considerations for additional information on vehicle and equipment clearances and corresponding system operating conditions.

TABLE 3 – Minimum Approach Distances (MAD) For Transporting Equipment Under Energized Transmission Lines. Table 3 may be used only when transporting or driving equipment under energized transmission lines under the following conditions:

- 8.17.6.3. Equipment is in transit (not being used to perform work) with the boom lowered and secured and no load on the load line, forks, bucket, etc.
- 8.17.6.4. A Safety Watcher is used to ensure MAD is maintained.



Table 3: MAD for Transporting Equipment Under Energized Transmission Lines	
Nominal Voltage Phase-to-Phase	MAD* Phase-to-Ground
50 kV or Less	4 feet
50 kV to 345 kV	10 feet
500 kV	16 feet
*Note: The minimum approach distances listed in Table 3 are reduced from those required in Table 2 due to the subtraction of the inadvertent movement factor. They may be used only when complying with the required conditions listed for the use of Table 3.	

8.17.7. TABLE 4, 5 and 6 – Minimum Approach Distances (MAD) for Qualified Electrical Workers

8.17.7.1. Tables 4, 5 and 6 apply only to qualified workers and provide Minimum Approach Distances (MAD) for phase-to-phase voltages commonly used on the BPA system. The distances in the following tables meet the minimum requirements prescribed by the Occupational Safety and Health Administration (OSHA), the National Electrical Safety Code (NESC) and NFPA 70E-2015. Refer to BPA Work Standard BPA-WS-5-1, Minimum Approach Distance (MAD) Considerations for details on how MAD's are derived and corresponding system operating conditions.

8.17.7.2. The MAD tables are based on the maximum transient voltages that can occur at the worksite for various worksite elevations and whether or not there will be tools in the air gap. The “MAD **Without** Hold Order” column accounts for transient voltages that can be generated by automatic reclosing, whereas the “MAD **With** Hold Order” columns are for transient voltages that can occur at the worksite even with automatic reclosing disabled. Table 4 provides the AC MAD's based on three elevation categories as listed in the heading of each table and shall be applied based on the elevation of the work site.

8.17.7.3. Only a “qualified electrical crew” may use the minimum approach distances found in Table 4, 5 and 6.

8.17.7.3.1. A “qualified electrical crew” is defined as a crew that is supervised by a Qualified Electrical Worker (as defined in section 23, Minimum Qualification for Qualified Electrical Workers) **and** on which **all** crewmembers must be qualified electrical workers **or** have adequate training and knowledge of the electrical hazards involved in the work being performed and of safe work practices required while working adjacent to energized lines and equipment.

8.17.7.3.2. This must be documented and verifiable and, at a minimum, must include safe grounding practices, MAD, Clearances and Hold Orders, step and touch hazards, and basic high voltage system knowledge.

<b>Table 4: AC MAD for Qualified Workers</b>			
<b>AC MAD for Elevations ≤ 3000'</b>			
<b>Nominal System Voltage Phase to Phase</b>	<b>Phase-Ground MAD (3)</b>		<b>Phase-Phase MAD (3)</b>
	<b>MAD Without Hold Order &amp; NO Tools</b>	<b>MAD With Hold Order for Tools</b>	<b>MAD With Hold Order for Tools</b>
301-750 V (1)	1'-1"	1'-1"	(2)
751 V - 5 kV	2'-1"	2'-1"	(2)
15 kV	2'-2"	2'-2"	(2)
34.5 kV	2'-7"	2'-7"	(2)
69 kV	3'-4"	3'-4"	(2)
115 kV	3'-6" *	3'-2"	4'-1"
138 kV	4'-0" *	3'-4"	4'-6"
161 kV	3'-8" *	3'-8"	5'-0"
230 kV	6'-2" *	4'-5"	6'-8"
287 kV	5'-2" *	4'-11"	7'-9"
345 kV	5'-11" *	5'-9"	9'-10"
500 kV (100" Design)	9'-10" *	7'-6"	14'-6"
500 kV (All Others) (5)	8'-8" *	7'-6"	14'-6"
500 kV Series Caps (4,5)	11'-3" *	11'-11"	24'-1"
<b>AC MAD for Elevations 3001' to 6000'</b>			
301-750 V (1)	1'-1"	1'-1"	(2)
751 V - 5 kV	2'-1"	2'-1"	(4)
15 kV	2'-4"	2'-4"	(4)
34.5 kV	2'-9"	2'-9"	(4)
69 kV	3'-7"	3'-7"	(4)
115 kV	3'-9" *	3'-3"	4'-4"
138 kV	4'-3" *	3'-5"	4'-9"
161 kV	3'-10" *	3'-10"	5'-4"
230 kV	6'-7" *	4'-9"	7'-1"
287 kV	5'-4" *	5'-3"	8'-3"
345 kV	6'-4" *	6'-0"	10'-6"
500 kV (100" Design)	10'-6" *	8'-0"	15'-7"
500 kV (All Others) (5)	9'-3" *	8'-0"	15'-7"
500 kV Series Caps (4,5)	12'-0" *	12'-9"	25'-11"
<b>AC MAD for Elevations 6001' to 9000'</b>			
301-750 V (1)	1'-1"	1'-1"	(2)
751 V - 5 kV	2'-1"	2'-1"	(4)
15 kV	2'-6"	2'-6"	(4)
34.5 kV	2'-11"	2'-11"	(4)
69 kV	3'-9"	3'-9"	(4)
115 kV	3'-11" *	3'-5"	4'-8"
138 kV	4'-5" *	3'-8"	6'-6"
161 kV	4'-0" *	4'-0"	5'-7"
230 kV	6'-11" *	4'-11"	7'-5"
287 kV	5'-7" *	5'-5"	8'-8"
345 kV	6'-8" *	6'-4"	11'-1"
500 kV (100" Design)	11'-0" *	8'-5"	16'-5"
500 kV (All Others) (5)	9'-9" *	8'-5"	16'-5"
500 kV Series Caps (4,5)	12'-8" *	13'-5"	27'-4"

**Minimum Approach Distances – Special Conditions**

- \* With verification of the actual substation bus height and location elevation the inadvertent movement factor (IMF) of 12 inches, included in MAD for worker motions, may be deducted at 115 kV and above to specifically allow vehicles in transit to safely pass under energized bus at those voltages. Equipment in transit (not being used to perform work) shall have secured any moveable parts (i.e. buckets, forks, load lines, loads) that could reduce clearances. [Reference Work Standard BPA-WS-5-1, Minimum Approach Distance (MAD) Considerations]
1. Avoid contact at voltages below 301 V.
  2. Phase spacing below 115 kV will not allow adequate MAD distances to be maintained for phase to phase work.
  3. Phase-to-Phase work with tools in the air gap shall include a deduction for any floating (insulated boom/bucket) or metallic conductive (hardware, insulators, armor rod) objects. This applies to both substation and transmission line work.
  4. If all of the series capacitors on a line are bypassed the MAD for series capacitors located mid-line may be the same as the MAD used for lines without series capacitors. The **with** and **without** hold order MAD's are the same for lines with series capacitors in service, refer to BPA-WS-5-1.
  5. For all 500 kV substations with series capacitors tied to the bus the 500 kV MAD listed for "All Others" may be used for work on series capacitor equipment.

<b>Table 5: MAD for Overhead Ground Wires – All Elevations</b>		
	<u>MAD Without Hold Order (ft-in)</u>	<u>MAD With Hold Order (ft-in)</u>
Insulated Overhead Ground Wire	2'-0"	2'-0"
Fiber Optic (OPGW)	2'-0"	2'-0"
Energized Ground Wire (Airway lighting & PCS up to 14.4 kV)	2'-6"	2'-6"

**DC Minimum Approach Distances:** The DC MAD's (Table 6) for Tools include a safety factor that permits the introduction of tools in the air gap to perform live-line work. The MAD's **with** and **without Hold Order** are the same since DC **restarts** (as opposed to AC reclose) do not create high system overvoltages after a fault. However, for all live-line work the DC terminal restart shall be both **blocked** and **distabled** for worker protection. The 72 kV MAD is for the neutral bus during single pole – metallic return mode operation.

<b>Table 6: DC MAD for Elevations ≤ 7000'</b>		
<b>Nominal System Voltage</b>	<b>Pole - Ground</b>	<b>Pole – Pole</b>
	<u>MAD for Tools Restart Blocked &amp; Disabled (ft-in)</u>	<u>MAD for Tools Restart Blocked &amp; Disabled (ft-in)</u>
72 kV	3'-4"	N/A
400 kV	7'-8"	12'-0"

448 kV	8'-10"	13'-3"
500 kV	10'-3"	14'-8"
520 kV	10'-9"	15'-2"
560 kV	11'-11"	16'-4"

8.18. Safety Watchers

- 8.18.1. The Contractor shall take adequate safety measures to protect its workers and others from induced voltages as well as direct contact. The Contractor shall utilize qualified Safety Watchers for the protection of workers and BPA facilities for the phases of the work where required by these specifications, law or regulations, or where it considers them to be necessary. A Safety Watcher’s primary responsibility is to limit the movement of personnel or equipment to prevent contact with energized overhead or underground electrical facilities.
- 8.18.2. A Safety Watcher must be a Qualified Electrical Worker, as defined in section 23, and hold a BPA issued Electrical Worker Permit to act as a Safety Watcher in BPA energized substations. Safety Watchers for work on BPA transmission lines external to an energized BPA substation may be performed by a contractor who holds a BPA issued Electrical Worker Permit or by a qualified line worker who holds a BPA Issued Clearance Certification. Safety Watchers must have satisfactory experience with energized high-voltage facilities of the type located in proximity to the workers they are assigned to watch. The requirements and process for obtaining an Electrical Worker Permit or a Term Clearance Certification are defined in the BPA Rules of Conduct Handbook. Contractors may obtain a list of individuals who hold an Electrical Worker Permit and/or a Term Clearance Certification from the CO.
- 8.18.3. A supervisor in charge of a job may not act as a Safety Watcher if there is any possibility of being distracted. Each worker is responsible for asking for a Safety Watcher whenever one is required. In the event of conflicting judgments, the more conservative interpretation shall prevail, pending review and resolution by the COTR or the onsite BPA Representative.
- 8.18.4. A Safety Watcher shall take a suitable location and give their undivided attention to ensure that no action on the part of the worker(s) being watched can result in violation of the MAD applicable to workers being watched. There must be a definite understanding between the Safety Watcher and the person(s) being watched as to when the watching begins and ends. Safety Watchers, who must leave their assigned jobs, shall first make sure that all worker(s) are in the clear and remain in the clear until the Safety Watcher returns or is replaced. Safety Watchers have the authority to halt the work operation whenever any unsafe act or condition is imminent. A red or orange vest shall be worn by the assigned Safety Watcher for all work activities which require the continual presence and observation of a Safety Watcher. It may be worn at the discretion of either the person in charge or the COTR or the onsite BPA Representative in other situations requiring a Safety Watcher.
- 8.18.5. A Safety Watcher is required for Qualified Electrical Workers who hold a BPA issued Electrical Worker Permit under the following circumstances:

- 8.18.5.1. When a worker is climbing into, out of, or changing location in a substation structure containing circuits normally energized at 600 volts or more. This does not apply to circuits barricaded or located 15 feet or more from the structure for circuits at 345 kV or less, and 20 feet or more for circuits operating at more than 345 kV. Multiple bays shall be considered one structure if workers can pass from one to the other without having to descend to the ground.
- 8.18.5.2. When inadvertent movement by a worker could result in violating the Minimum Approach Distance MAD as specified in Table 4, 5 or 6 as applicable.
- 8.18.5.3. When operating or moving motor-driven equipment in the vicinity of high-voltage circuits and there is a possibility of violating the Minimum Approach Distance MAD in Table 4, 5 or 6 as applicable.
- 8.18.5.4. Whenever the COTR, the onsite BPA Representative, or Contractor requires a Safety Watcher.
- 8.18.6. Safety Watchers for non-qualified workers and workers holding a BPA issued Non-Electrical or Restricted Electrical Worker Permit shall be required:
  - 8.18.6.1. Whenever a Safety Watcher is required for qualified electrical workers.
  - 8.18.6.2. Whenever a Clearance is necessary for the accomplishment of the work.
  - 8.18.6.3. When operating or moving motor-driven equipment in an energized substation yard which are not guarded or barricaded to prevent violation of the minimum approach distance in Table 1.
  - 8.18.6.4. Any time the COTR, the onsite BPA Representative or Contractor requires a Safety Watcher.
- 8.18.7. Site Specific Safety Watcher Plan: Work in energized substations and facilities may require one or more Safety Watchers. As a part of the SSSP, the Contractor shall consult with a Qualified Electrical Worker (familiar with work in high-voltage facilities) and/or Substation Operator about the need for Safety Watcher(s). If a Safety watcher is to be provided, the Contractor will provide a detailed plan for the use of Safety Watchers. This plan will include the work areas which will require the assignment of a dedicated Safety Watcher, and the number of Safety Watchers to be assigned. The Safety Watcher Plan shall also discuss specific Equipment Grounding Requirements, and the use of PPGs and Multiple PPGs.

## 9. Environmental Hazards

- 9.1. The contractor should contact the COTR to verify the status of ongoing material sampling to see if any environmental hazards have been identified. If the Contractor suspects the presence of hazardous materials not previously identified, the Contractor will notify the COTR prior to disturbing the subject materials.
- 9.2. 9.2 On contracts where BPA has identified that environmental hazards exist (i.e. asbestos, lead, mercury, silica, etc.) or has indicated that the potential for environmental hazards may exist, the Contractor shall have a COMPETENT PERSON on site that has the appropriate level of training to identify the hazards and select the appropriate control strategy in accordance with all Federal and State regulations. After the Contractor's Competent Person has selected a Control Strategy for managing the

subject materials, a Site Specific Abatement (and/or Management) Plan shall be developed and submitted to the BPA Safety Organization for Review and Comment.

- 9.2.1. The use of respirators is required when occupational exposure levels exceed OSHA Permissible Exposure Limits (PELs) or American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs), and engineering or administrative exposure controls are not feasible to implement.
- 9.2.2. When respirators are required Contractors shall have a written respirator protection program.
- 9.2.3. The Contractor shall conduct occupational exposure assessments/measurements.

## 10. Equipment and Rigging

- 10.1. Shop made tools or equipment must be engineered, stamped with the W.L.L. (working load limit), and proof tested to 125% of the W.L.L. before being used in the field.
- 10.2. The Contractor shall have a program in place to adequately inspect all ropes, slings, rigging components and tools for damage or defects and follow applicable consensus standards and manufacturer recommendations for inspection and removal from service or repair.
- 10.3. Lifting and Hoisting using Cranes and/or Excavators: Contractor will develop and review a Lift Plan with all site workers in advance of performing lift. For "Critical Lifts" Contractor will develop and submit a Site Specific Critical Lift Plan to the BPA Safety Organization for review and approval, prior to performing the work. A Critical Lift is defined as:
  - 10.3.1. A load that is over 75% of the crane (or other machine).
  - 10.3.2. Load is more than 20 tons.
  - 10.3.3. Lift is over existing operating systems, such as pipelines, electrical service, etc.
  - 10.3.4. Lift requires the use of two or more cranes or machines (such as large excavators). This applies to both lifting and "walking" loads into position to perform the lift and setting of the load.
  - 10.3.5. Hoisting of contractor workers on a suspended work-platform or man-basket.
  - 10.3.6. Blind Lifts where the operator(s) cannot clearly see where the suspended load is being placed.
  - 10.3.7. Lifts made over occupied buildings and/or structures.
  - 10.3.8. Lifts where the designated Lift Zone is tight, confined, and offers limited egress for essential personnel (such as the signal-person, tag-line workers, etc.).
  - 10.3.9. Lifts made on sloping and/or uneven ground.

- 10.3.10. Lifts where the machines and/or workers will be in or above water.
- 10.3.11. Lifts where the respective project safety representatives (BPA/contractor/subcontractor and/or owner) identify that additional safety planning and review would be beneficial to the safety of personnel, property, and equipment.

## 11. Fall Protection

- 11.1. Fall protection equipment shall be used by Contractors working at elevated locations more than four feet above the ground except on portable ladders or fixed ladders less than 20 feet. Fall protection equipment shall meet all applicable consensus standards.
- 11.2. Contractors working aloft in an aerial lift or on platforms supported by lift equipment shall wear approved fall protection Personal Protective Equipment (PPE) consisting of a full body harness and be attached with either a self-retracting device or shock absorbing lanyard.
- 11.3. During work activities above 4 feet that requires fall protection PPE, Contractors shall ensure that at least two qualified workers are present at the work site for rescue purposes. Contractors shall contact local First Responder agencies to assure that qualified personnel and necessary equipment is available to respond to the respective project site to aid in Fall Protection Rescue efforts. If local First Responder agencies are unable to provide adequate Fall Protection rescue personnel and/or equipment, the Contractor shall include a formal and Site Specific Fall Protection Rescue Plan as a part of the submission of the project SSSP.
- 11.4. Contractors working at elevated locations more than 4 feet above the ground and utilizing fall protection PPE shall wear an approved climbing style helmet attached with chin strap.
- 11.5. Contractors performing work at a height of 10 feet or greater shall have a written, site specific fall protection/rescue work plan, reviewed by the BPA Safety Office, in place prior to the commencement of work.
- 11.6. Contractors shall ensure that portable ladders are inspected and contain no defects, be adequately secured, extend at least three (3) feet above any upper landing surface, and shall not be loaded past their manufacturer's rated load capacity.
- 11.7. Working Over or Near Water (piers, wharves, quay, walls, barges, watercraft, aerial lifts, crane-supported work platforms, etc.) Personal Flotation Devices (PFD) are required for all work over or near water unless continuous fall protection is used without exception to prevent workers from falling into the water, thus the contractor has effectively removed the drowning hazard and PFD's are not required.

## 12. Fiber Optics

- 12.1. When working with fiber optics, the use of personal protective equipment is required to prevent injury. Eye protection shall be worn when splicing glass fiber. Care should be taken during the cleaving process to protect the eyes and the body from broken glass pieces.

**CAUTION: Never look into the end of an optical fiber. The laser light that may be present is invisible and eye damage may occur.**



### **13. Fire Hazards**

- 13.1. Fire prevention and suppression will also comply with Construction Technical Specification division 01 35 26.
- 13.2. Flammable liquids within 21.5 meters (70 feet) of conductors energized at voltages of 345 kV and higher shall not be transferred from one metal container to another unless the two have been electrically bonded together to eliminate arcing.
- 13.3. Metal safety cans are an approved container of not more than five (5) gallons capacity, having a spring-closed lid and spout cover and so designed that it will safely relieve internal pressure when subjected to fire exposure. They are the preferred method for storing flammable and combustible liquids. Only plastic containers that are UL (Underwriters Laboratory) or FM (Factory Mutual) approved shall be used. These approved plastic safety cans are made from a high density polyethylene with steel fittings (usually stainless) that include leak proof closures, relief mechanisms and spark arrestors.
- 13.4. Fuel storage shall not take place under or adjacent to energized lines or equipment.
- 13.5. The Contractor shall be responsible for contacting the local jurisdiction having authority and being aware of and complying with any fire restrictions, shutdowns, "hoot owls" or special requirements.
- 13.6. The Contractor is responsible for carrying fire suppression tools and equipment as required by the authority having jurisdiction and training workers in their use.
- 13.7. Welding, Cutting, Brazing and Grinding operations shall comply with OSHA 1910.252 and/or any applicable Federal, State standard or regulation.

### **14. Hazard Communication**

- 14.1. The Contractor shall supply workers with effective information and training regarding any hazardous chemicals used at the work site and shall comply with OSHA 1910.1200, 1910 Subpart Z and/or any applicable Federal, State standard or regulation.
- 14.2. The Contractor shall maintain any required Safety Data Sheets (SDS) at the work location and have them available to workers.

### **15. Job Briefing**

- 15.1. The contractor shall conduct and document job briefings each morning with safety as an integral part of the briefing, and shall provide copies of the daily job briefing and any other safety meeting notes to the COTR or the onsite BPA Representative. The notes will at a minimum show the date, time, topics discussed, and attendees of each meeting, and will be retained for the duration of the warranty.
  - 15.1.1. The person-in-charge of the job shall conduct job briefings with all workers assigned to the job. Job briefings shall be held at the work site with additional briefings conducted for late arriving workers, workers that weren't present during the initial job briefing, and when work situations change that may pose different or additional hazards to workers. Workers working alone shall ensure that their day's work is planned and performed as if a safety briefing covering the requirements was conducted. When more than one

craft are working together, the person-in-charge of the job must be clearly established as part of the job briefing.

All job briefings must cover at least the following subjects:

- Hazards associated with the job
- Work procedures
- Special precautions
- Energy source controls
- Personal protective equipment
- Clearances, Work Permits, Hold Orders
- Emergency procedures/communications
- Special Permits (e.g., confined space; fall protection plans, etc.)
- Worker Training and Qualifications

#### **16. Lockout/Tagout (LOTO) – Control of Hazardous Energy**

- 16.1. The Contractor shall communicate and familiarize their workers and affected BPA employees with their respective LOTO locks, tags, devices and procedures.
- 16.2. The Contractor shall ensure that no workers are exposed to injury from the unexpected startup or release of stored energy systems.
- 16.3. Contractors performing work on machinery or equipment where such hazards may exist shall have a documented LOTO training and work program in place before performing such work. This program shall conform to all the requirements of Federal OSHA 1910.147 and any other applicable Federal or State standards and regulations.
- 16.4. The Contractor shall supply all required locks, tags, and devices required for locking out and tagging the machinery or equipment to be worked on.

#### **17. Medical Services and First Aid**

- 17.1. A person or persons shall be adequately trained to render First Aid/CPR/AED at the work site. Adequate first aid supplies shall be readily available. An automated external defibrillator (AED) shall be available at the work site.

#### **18. Personal Protective Equipment (PPE)**

- 18.1. The Contractor shall furnish all required safety and personal protective equipment, except that which has been specified to be furnished by BPA. All persons on all projects shall wear non-conductive hard hats meeting the requirements of OSHA/ANSI.
  - 18.1.1. Yellow non-conductive hard hats with company logo are restricted to workers who hold a BPA Electrical Worker Permit.

- 18.1.2. Qualified Line Clearance Tree Trimmers (QLCTT) shall wear red hard hats.
- 18.1.3. All others shall wear white non-conductive hard hats.
- 18.2. Appropriate footwear that provides adequate support and protection to the foot, toes and ankles for the work being performed shall be worn. Lace-up, over the ankle boots with rigid sole and heel meeting ASTM F 2413-11 with an EH rating or ASTM F 2413-05, Class 75 with EH rating shall be worn in all work areas where hard hats are required and other areas as determined by a supervisor. Supervisors have the responsibility for assuring that appropriate footwear is worn. Workers have the responsibility to wear appropriate footwear for the job.
- 18.3. While BPA's minimum qualifications for protective footwear are identified above, specialized footwear, in accordance with standard industry practice and appropriate for the work being performed, shall be worn at all times while executing the work tasks requiring specialized Personal Protective Equipment (PPE). Supervisors and workers have the responsibility of ensuring appropriate footwear is worn.
- 18.4. The Contractor shall assure that workers operating All-Terrain Vehicles (ATV's) on BPA right of ways shall be trained on the safe operation of the specific ATV being operated and that they wear a helmet. State ATV operator requirements in which the work is occurring must also be met.
- 18.5. Red or orange reflective vests shall only be worn by Safety Watchers.
- 18.6. For PPE related to Arc Flash Hazards see section 8.12.

## **19. Radio Frequency Exposure, for Personal Communication Systems**

- 19.1. Radio Frequency (RF) emissions can be harmful to workers within RF fields of high exposure levels. BPA has established a safe working distance of five (5) feet in all directions around structure-mounted transmitting antennas, to keep workers outside the RF field. Workers may be closer than the minimum safe working distance for a brief period of time, such as while climbing past an energized transmitting antenna.

Workers may remain closer than the minimum safe working distance for extended periods of time only if using a personal RF Exposure Monitor, which alarms with respect to maximum permissible exposure levels. If the personal RF monitor signals an alarm for a level greater than the maximum permissible exposure level, the emitting antenna should be de-energized during the period of worker exposure, and in no case shall the exposure exceed six (6) minutes in any 15-minute period.

- 19.2. BPA structures at communications sites such as radio stations and substations may have antennas that may be energized without notice. A personal RF monitor shall be worn at all times at these sites while working on the structure. Personnel should not assume that the area is without RF exposure. If the work required exceeds the maximum permissible exposure, the land mobile radios(s) and/or PCS/wireless equipment should be de-energized and tagged consistent with the contractors' lockout/tagout procedures so that it cannot be energized while work is in progress.
- 19.3. The five (5) -foot rule stated here is based on a system-wide average for most PCS/Cellular, HF, VHF, UHF, 700 MHz, and 800 MHz antennas on BPA communications structures (transmission towers, communications towers, buildings, poles). The minimum safe working distance for these antennas may be greater than or less than five (5) feet. Any antenna that requires a minimum safe working distance

greater than five (5) feet will have a warning sign posted to indicate the safe working distance and listed in BPA's Transmission Line Maintenance (TLM) database.

- 19.4. At ground level, workers should be at a safe distance from BPA structure-mounted transmitting antennas. However, broadcast antennas, radar antennas, and paging system at foreign sites adjacent to BPA communications structures can emit RF energy that exceeds the maximum permissible exposure levels. For sites identified as having excessive exposure levels, a personal RF monitor must be worn at all times. If the personal RF monitor indicates excessive levels and work is thought to exceed six (6) minutes in a 15-minute period, the worker shall contact the foreign adjacent site owner and request a reduction in transmit power level while work is in progress.
- 19.5. Vehicle-mounted transmitting antennas have a safe working distance of two (2) feet (24 inches) while transmitting. The exposed metal parts of a vehicle-mounted transmitting antenna should never be touched while transmitting as it will produce a painful burn on bare skin.

Reference: BPA Work Standard and Guide BPA-WS-11-5, Communication Antennas – RF Exposure.

## **20. Traffic Control**

- 20.1. The Contractor is responsible for ensuring that all traffic control measures required by Federal, State, local laws and regulations are followed and that they conform to the DOT Federal Highway Administration MUTCD (latest edition) as well as State and local law.
- 20.2. All flaggers shall have in their possession an appropriate State certification card attesting to having completed the required training.

## **21. Trenching and Excavation**

- 21.1. Before any trenching or excavation work that is 4 feet or more in depth commences, the Contractor must submit to BPA for review, an excavation site safety plan for the specific excavation work proposed.
- 21.2. This plan must conform to all applicable State and Federal trenching, shoring and excavation safety standards.
- 21.3. If workers enter an excavation, the Contractor shall have a COMPETENT PERSON on site that is capable of identifying existing and predictable hazards and who has authority to take prompt corrective action.
- 21.4. Prior to entry into excavations 4 feet or more in depth an Excavation Entry Permit completed by the competent person and approved by the supervisor shall be posted on site. The Contractor shall use BPA form 5480.28 (Excavation/Trenching Permit) or an equivalent form approved by BPA.
- 21.5. Excavations 4 feet or more in depth shall not be entered unless sloped to the appropriate angle of repose, shored or shielded.
- 21.6. The Contractor shall be responsible for obtaining all necessary locates before any work commences. The Contractor shall follow appropriate digging recommendations which may include hand digging (potholing) a test hole to expose underground utilities, including the ground grid to determine location before digging with power equipment.

## **22. Welding**

- 22.1. Welding ground lead must be placed on the equipment being welded to assure a solid return path to the welding machine. Do not use ground grid risers for welding ground return paths to avoid causing stray currents entering the ground grid.
- 22.2. Welders and helpers shall not “come between” welding current paths to avoid becoming part of the welding circuit.

## CHAPTER 2 – WORK IN SUBSTATIONS AND RELATED BPA FACILITIES

### 23. Minimum Qualifications for Qualified Electrical Workers (QEWs)

- 23.1. The Contractor shall ensure that all QEWs meet the following qualifications:
- 23.1.1. Must have completed a Department of Labor (DOL) approved apprenticeship program consisting of on-the-job training and related training or possess an engineering degree in a related field, including field engineer, commissioning and testing field engineer, etc. Related training is a course of study, usually covering the theoretical aspects of the trade which may be accomplished by correspondence or classroom instruction or a combination of correspondence and classroom instruction. On-the-job apprenticeship training shall show documented supervised work experience on normally energized high voltage lines or equipment.
  - 23.1.2. Shall be qualified by experience or training to perform the specific type of work outlined in this contract.
  - 23.1.3. Shall have completed in the past two (2) years a grounding/bonding training course that includes appropriate grounding techniques, step and touch, and the creation of an equipotential zone.
  - 23.1.4. Shall have a current First Aid/CPR/AED card.
  - 23.1.5. Shall be fluent in the English language as well as the language(s) of contractor workers under their supervision.
  - 23.1.6. The Contractor shall make available, upon request by the Contracting Officer or authorized representative of the Contracting Officer, documentation verifying the QEWs qualifications.

### 24. Coupling Capacitors and Bushing Potential Devices

- 24.1. Work in the base units of this equipment, other than tuning or voltage adjustment, shall be performed under the protection of a Clearance as outlined in BPA Work Standard BPA-WS-9-7, Bushing PDs, Coupling Caps & Line Tuning Units.

### 25. Current Transformer (CT) Secondary

- 25.1. The CT secondary circuit shall not be opened while the primary is energized, due to the possible development of a high secondary voltage.
- 25.2. When work is to be performed on CT circuits that are normally in service, the Test and Energization Engineer (T&E) or BPA System Protection and Control (SPC) employee shall lead the job briefing and approve any wiring work on CT circuits, including the shorting of CT's.
- 25.3. Only Qualified Electrical Workers who have completed BPA's CT Safety Training within the last 3 years shall perform work on CT secondary circuits which are normally in service.
- 25.4. All work shall be performed in accordance with BPA Work Standard BPA-WS-9-1, Servicing and Testing Current Transformers.

## 26. Grounding

- 26.1. The Contractor shall not perform any work on energized BPA high voltage conductors or equipment, and shall not come within the Minimum Approach Distances specified in Tables 1 through 6 as applicable.
- 26.2. For work in energized facilities, the Contractor shall provide a Site Specific Grounding Plan as a part of the SSSP. The Grounding Plan will describe work areas where grounding is required, and provide specifics about establishing Equipotential Zones (EPZ), where PPGs, multiple PPGs, and equipment grounding will be required.
- 26.3. New lines or equipment may be considered de-energized and worked as such where:
  - 26.3.1. The lines or equipment are grounded, or
  - 26.3.2. The lines or equipment are not connected to the power system (see 27.3.2) and the hazard of induced voltages is not present. Adequate clearances or other means must be implemented to prevent contact with any nearby energized lines or equipment and the new lines or equipment.
- 26.4. Dangerous voltages, which may require grounding a line or equipment, may be present from various sources, which include, but are not limited to the following:
  - 26.4.1. Power lines or other energized high voltage equipment by accidental contact or by “feedback” through station service or potential transformers.
  - 26.4.2. Induced voltages coupled from adjacent energized lines, from electrical charges carried by wind and dusts, etc. Contractors shall verify that the hazard of induced voltages is not present.
  - 26.4.3. Remote lightning. Note: Portable protective grounds may not provide complete personal protection for close-in strikes. Aerial work shall be suspended and personnel shall stay in the clear during times that lightning is within sight or sound.
  - 26.4.4. Trapped electrical charges, such as in capacitors or on transmission lines.
  - 26.4.5. Accidental energization due to the inadvertent closing of an isolating device.
- 26.5. All normally energized conductors and equipment connected to the power system shall be treated as energized until cleared and tested or otherwise determined to be de-energized and then grounded with portable protective grounds. No workers or equipment shall come within the minimum approach distance (Tables 1 through 6 as applicable) unless these provisions are met.

## 27. Requirements for work on normally energized lines and equipment that are separated by an isolating device under the provisions of a Work Clearance.

Note: Contractors are not allowed to hold a Clearance for work on equipment in a BPA Substation.

- 27.1. BPA electrical workers will clear and tag the equipment. A Clearance shall then be issued to the BPA Clearance Holder. The BPA Clearance Holder shall:



- 27.1.1. Know the limits of the Clearance, the facilities included, and the status of ground switches within the Clearance. The Clearance Holder shall also know the Clearance number, the time of issue and the name of the Dispatcher or Substation Operator who issued the Clearance.
  - 27.1.2. Know the name(s) of other Clearance Holders and the type of work they are accomplishing when more than one Clearance is issued on the same line or equipment.
  - 27.1.3. Shall review the Contractor's grounding plan in the SSSP with the crew foreman and either concur with the plan or modify, in consultation with the crew foreman, as required.
  - 27.1.4. Direct the installation of barriers or guards as necessary to prevent accidental contact with adjacent energized facilities before allowing work to begin in areas where such hazards exist.
  - 27.1.5. Direct the utilization of Safety Watchers as required.
  - 27.1.6. Convey this information to all persons working under that Clearance before work begins. In addition, any specific hazards associated with the work shall be pointed out.
  - 27.1.7. The Clearance Holder shall remain at the job site while work or testing is being performed on equipment under a Clearance. "At the job site" means at the location where the work is being performed. The holder of a Clearance may place or respond to telephone or radio calls, perform paperwork incidental to the job at hand, use available restroom facilities, or perform other minor tasks incidental to the work and still be considered "At the Job Site".
- 27.2. The Contractor shall:
- 27.2.1. Know the limits of the Clearance, the facilities included, and the status of ground switches within the Clearance. The Contractor shall verbally acknowledge to the Clearance Holder, the Clearance number, the time of issue, and the name of the Dispatcher or Substation Operator who issued the Clearance. In addition, they shall understand any specific hazards that may be associated with the work.
  - 27.2.2. Know that all Low-Voltage isolating Device ACBs that are the limits of the Clearance have been tested open before touching or coming within the applicable Minimum Approach Distance of normally energized electrical parts.
  - 27.2.3. Install portable protective grounds as described in the SSSP or as modified by the BPA Clearance holder in consultation with the crew foreman.
  - 27.2.4. Install barriers and guards as directed by the Clearance Holder.
  - 27.2.5. Utilize a Safety Watcher when one is required.
  - 27.2.6. Cease work on equipment under a Clearance when the Clearance Holder is not at the job site.

### 27.3. When Clearances Are Not Required

- 27.3.1. New Construction: During the construction of new facilities, a Clearance is not required if power system equipment is not in place to provide a connection to the power system by the closing of an isolating device.
- 27.3.2. Return to Construction Status: Reconductoring of existing lines, removal and/or replacement of facilities, or for other similar type work. A Clearance is not required for this work providing that a letter requesting the work to be accomplished without a Clearance has been submitted to and approved in writing by the Manager of the Dispatching Office having jurisdiction over the equipment. Under the protection of a Clearance, the facilities will be separated from all possible sources of energization by the physical removal of the predefined circuit parts such as risers, wire spans, bus work, or other conductor, which completely separates the equipment from the power system. Reference BPA Work Standard 3-3, Work on Equipment Separated from the Power System.

## 28. Grounding Normally Energized Electrical Equipment

- 28.1. De-energized conductors and equipment which are to be grounded shall first be tested for voltage using approved methods.
  - 28.1.1. All conductive parts in the work area that may be contacted during the course of the work shall be at the same potential and shall be tied to a common ground.
  - 28.1.2. Before cutting or separating any part of the protective grounding circuit that could expose a worker to a possible difference of potential, the separated components shall be bonded together and tied to ground.
  - 28.1.3. No disconnect switch, power circuit breaker, transformer\*, wave trap, fuse, or current limiting reactor shall be part of the protective grounding circuit.
    - \*Note: Does not apply to a visible single-turn primary such as in a “donut” CT circuit.
  - 28.1.4. All ground leads from each ground set shall be connected at the ground end before any conductor end from that same ground set is connected to de-energized electrical parts.
  - 28.1.5. Workers should avoid handling or contacting the ground lead while the conductor end is being installed or removed. During removal, all ground leads of each ground set shall be disconnected from the conductor end first. The conductor ends from that same set shall be moved to a point in the clear of the de-energized electrical parts before any ground lead from that same ground set is removed from the ground end.
- 28.2. When removing portable protective grounds, the conductor end shall first be removed from the line or equipment using a live-line tool.
- 28.3. Ground leads. Ground leads, as well as all other parts of a grounding system, shall be capable of conducting the anticipated fault current. All grounding parts shall have a minimum conductance of No. 2/0 AWG copper. Grounding for personal protection shall not be accomplished through vehicles or equipment. Multiple (parallel) grounds

may be required at some locations on the BPA power system when the anticipated fault current exceeds the capacity of a 2/0 copper ground set. These locations (if applicable) will be provided by BPA in the contract technical specifications. When multiple grounds are required, the grounding cables for each phase shall be of the same length and have the same type of ground end and conductor end clamps. Minimum requirements and procedures for assembly, maintenance and testing of portable protective grounds shall be in accordance with BPA Work Standard BPA-WS-6.4.

28.4. Portable Protective Grounds: (PPG): Protection from electric shock is obtained by using approved Portable Protective Grounds to bond all conductive items together and to a common ground.

28.5. Portable Protective Grounds (PPG) – Voltage Testing: Immediately before applying PPG, a voltage test shall be made on each phase with a “voltage detector” instrument that produces both a visual and audible signal. If there is any indication that the circuit being tested is at full line potential, the circuit shall be treated as energized. **Do not assume it is caused by induction from nearby power lines. Do assume** that the circuit is still energized and take proper precautions, i.e. notify the dispatcher, re-check the circuit identification, maintain the Minimum Approach distance, and Do Not apply PPG until assured that the circuit is indeed de-energized.

28.6.2 Portable Protective Grounds (PPG) shall be applied before a worker or equipment contacts or comes within the MAD of the circuit. PPG shall be installed to protect persons from the hazards of accidental energization from any source of power system energization. Such sources of power system energization include 1. Accidental energization from the power system, power lines or other energized high voltage equipment by accidental contact or accidental closing of an isolating device. 2. Back feed through station service or potential transformers. 3. Remote lightning causing a fault on an adjacent circuit, or a strike to the de-energized one.

28.6. Attachment points of PPGs and bonding jumpers shall be made by removing any paint or corrosion before attachments are made.

28.7. The Clearance holder shall identify all parts of the protective grounding circuit prior to the installation of PPG to ensure that a thorough understanding of the specific grounding circuit exists by all crew members prior to the start of work.

28.8. When Portable Protective Grounds are required, they shall be installed as close to the work being performed as practical and in such a manner as not to be disturbed during the course of the work, and shall require an adequate number of 2/0 copper ground leads or equivalent to effect, and maintain at all times, a visible three-phase short and ground on the AC circuit. The minimum distances specified in Tables 4, 5 or 6 as applicable shall be maintained by qualified electrical workers from ungrounded conductors at the work location.

28.9 Any reference to Portable Protective Grounds shall mean an adequate number of ground leads to effect, and maintain at all times, a visible three-phase short and ground on the AC circuit. Visible grounding may be accomplished through conductive parts of equal current carrying capacity as the protective grounds require, but shall not be effected through a ground grid or other concealed conductors. All portable protective grounds shall be installed and removed with approved live-line tools.

- 28.9. In substations, when Portable Protective Grounds have been installed at all possible sources of energization from the high voltage power system, separated circuit parts in the work area to be contacted during the course of the work shall be bonded and tied to ground by application of either discharge grounding cables or portable
- 28.10. When attaching Portable Protective Grounds, the ground end shall be attached first, and the conductor end shall be attached and removed using a live-line tool. Workers should avoid handling or contacting the ground lead while the conductor end is installed or removed. During removal, all ground leads of each ground set shall be disconnected from the conductor end first. The conductor ends from that same set shall be moved to a point in the clear of the de-energized electrical parts before any ground lead from that same ground set is removed from the ground end.
- 28.11. Removing ground leads. In some cases it may be difficult to remove a ground lead with a live line tool (such as one installed during construction). In these cases, a second ground lead may be installed alongside the original one. The original one may then be removed by hand, and the second and remaining ground lead removed with a live line tool.
- 28.12. Portable Protective Grounds, for each Clearance. Before workers or equipment contact or come within the Minimum Approach Distance MAD of a circuit, separate PPG shall be installed for each Clearance issued.
- 28.13. Minimum Crew Size (Portable Protective Grounds)
- 28.13.1. The minimum crew for installing portable protective grounds (PPGs) shall consist of two qualified electrical workers, or one qualified electrical worker and an electrical worker (electrical apprentice or journey-level worker in training) who has been approved by both the contractor's personnel responsible for directing the work task and the qualified electrical worker involved.
- 28.13.2. Portable Protective Grounds, (PPG), Special Requirements. Multiple PPG are required in many locations on the BPA system. They must be capable of carrying high magnitude fault current until the fault is cleared by protective relays and one or more power circuit breakers. The Contractor may contact the BPA COTR to determine which substations require multiple PPG.
- 28.14. Grounding Equipment
- 28.14.1. Aerial lifts, cranes, booms, and any other equipment working in proximity to energized lines or equipment shall be grounded with 2/0 AWG copper ground cables. Multiple (parallel) ground leads may be required at some locations on the BPA power system when the anticipated fault current exceeds the capacity of a single 2/0 copper ground. These locations (if applicable) will be provided by BPA in the contract technical specifications.
- 28.14.2. Equipment working within the MAD of normally energized grounded conductors or equipment shall be made at the same potential as the grounded conductor(s) or equipment being worked on. They shall be tied to a common ground to create an equipotential zone.
- 28.14.3. The minimum crew for removing portable protective grounds shall consist of one qualified electrical worker and one other worker.

## 29. Ground Grid

- 29.1. Installation of ground grids on the BPA system, and any connections to the ground grid are considered electrical work. Ground grid installation in substations and on transmission line rights-of-way shall be performed by qualified workers of a licensed electrical Contractor. The licensed electrical Contractor shall have experience working in substations and/or on transmission line projects. The qualified worker shall have experience working in substations and/or on transmission lines installing ground grids and shall be adequately trained and familiar with the safety-related work practices involved with ground grid installations.
- 29.2. Workers shall not “come between” cut sections of substation ground grids. Separated sections of the grid shall only be connected after first being jumpered using hot methods by Qualified Electrical Workers under the supervision of the COTR or the onsite BPA Representative.
- 29.3. Do not perform work on ground grid conductors with lightning in the area.
- 29.4. All work shall take place entirely on or entirely off the ground grid to avoid the hazards of transferred potential. If it is unavoidable for a work procedure to take place simultaneously on and off the grid (such as using a crane, pulling cable and directional boring), the COTR or the onsite BPA Representative must be consulted for specific methods that would minimize the hazard.

Reference: Please see Substation Maintenance Standards and Guides SM-STD-13-1-5-*Grounding, Precautions when Contacting the Substation Ground Grid and Grounding Work Equipment & Vehicles in Substations*, SM-STD-13-1-15

- 29.5. For worker protection, the local BPA Substation Operator shall be notified whenever any work is being performed on the ground grid.

## 30. Switches, Isolating Devices, Energized, Restrictions On

- 30.1. Work shall not be performed on one part of a high voltage switch or disconnect if the remainder of the switch or disconnect is energized unless approved barriers are installed. This does not prohibit connecting or disconnecting a bus or line to the de-energized end of a switch or disconnect, under the provisions of a Clearance, if the Minimum Approach Distance MAD (Tables 4, 5 or 6) is not violated. In both cases, precautions must be taken to assure that the switch cannot be operated until all work is completed.

## CHAPTER 3 – WORK ON BPA RIGHT-OF-WAYS AND TOWERS

### 31. Minimum Qualifications for Qualified Electrical Line Workers

- 31.1. The Contractor shall ensure that all line workers meet the following qualifications.
- 31.1.1. All qualified line workers must have completed a Department of Labor (DOL) approved apprenticeship program consisting of not less than 5600 hours of on-the-job training and not less than 400 hours of related training. Related training is a course of study, usually covering the theoretical aspects of the trade which may be accomplished by correspondence or classroom instruction or a combination of correspondence and classroom instruction. On-the-job apprenticeship training shall show documented, supervised work experience on both wood pole and steel structures including energized lines of 12.5 kV and/or higher.
  - 31.1.2. Line workers shall have demonstrated proficiency with recent experience installing, maintaining, erecting and/or repairing power line structures, lines and equipment operating at voltages of 12.5 kV and/or higher. Line workers shall be qualified by experience or training to perform the specific type of work outlined in this contract. Line workers working on BPA transmission lines rated at 115 kV or above shall have sufficient experience and training to understand and safely work in proximity to the hazards posed by high voltage transmission lines.
  - 31.1.3. Line workers certified to hold a BPA Work Clearance shall have a demonstrated work history of successfully working under at least three Clearances on the BPA or an equivalent power system. At the discretion of the COTR, documented training may be substituted for this requirement.
  - 31.1.4. Line workers shall have completed in the past two (2) years a grounding/bonding training course that includes appropriate grounding techniques, step and touch, and the creation of an equipotential zone.
  - 31.1.5. Line workers shall have a current First Aid/ CPR/AED card.
  - 31.1.6. Line workers and equipment operators shall be fluent in the English language as well as the language(s) of contractor workers under their supervision.
- 31.2. The Contractor shall make available, upon request by the CO or authorized representative of the CO, documentation verifying line workers' qualifications.

### 32. Minimum Crew Size

- 32.1. When climbing structures, all work crews shall have a minimum of one qualified line worker and another electrical worker (electrical apprentice or journey-level worker in training) who has been approved by both the Contractor's personnel responsible for directing the work task and the qualified line worker involved.
- 32.2. When sagging from a structure (by transit or other), all crews shall consist of one worker on the ground qualified in climbing rescue or one of the following:
- 32.2.1. A ground worker with radio contact with an onsite worker qualified in climbing rescue,

- 32.2.2. Continuous radio contact with an onsite worker qualified in climbing rescue, or
- 32.2.3. Visual contact with another worker qualified in climbing rescue.
- 32.3. The minimum crew for installing PPG's shall consist of two (2) qualified electrical line workers, or one qualified electrical line worker and an electrical worker (electrical apprentice or journey-level worker in training) who has been approved by both the contractor's personnel responsible for directing the work task and the qualified line worker involved. When working on line structures, the required electrical workers must be in the structure and be assisted by adequate help on the ground.
  - 32.3.1. When applying Portable Protective Grounds (PPGs) on transmission lines, the required electrical workers shall be in the structure and/or an aerial lift device and be assisted by adequate help on the ground. These required electrical workers shall work closely together observing each other testing for voltage and applying Portable Protective Grounds. Additional Portable Protective Ground sets may be installed on the same circuit, and all sets may be removed by one Qualified Electrical Worker and one other worker portable protective grounds.
  - 32.3.2. Additional portable protective ground sets may be installed on the same circuit and all sets may be removed by one qualified line worker and one other worker.
- 32.4. All other electrical work crews shall have a minimum ratio of one to one qualified line worker to non-qualified worker. Crews not performing electrical work or aerial work (e.g., road crews) need not comply with this requirement.
- 32.5. A crew is defined as a group of workers performing a task at the same work location. A work location is defined as a specific tower site or conductor span between towers.

### **33. Requirements for work on lines physically separated from the BPA System including new construction and Return to Construction status.**

- 33.1. When Clearances Are Not Required
  - 33.1.1. 33.1.1 New Construction: During the construction of new facilities, a Clearance is not required if power system equipment is not in place to provide a connection to the power system by the closing of an isolating device.
  - 33.1.2. Return to Construction Status: Reconductoring of existing lines, removal and/or replacement of facilities, or for other similar type work. A Clearance is not required for this work providing that a letter requesting the work to be accomplished without a Clearance has been submitted to and approved in writing by the Manager of the Dispatching Office having jurisdiction over the equipment. Under the protection of a Clearance, the facilities will be separated from all possible sources of energization by the physical removal of the predefined circuit parts such as risers, wire spans, bus work, or other conductor, which completely separates the equipment from the power system. Reference BPA Work Standard 3-3, Work on Equipment Separated from the Power System.



- 33.2. The Contractor shall not perform any work on energized BPA high voltage conductors or equipment and shall not come within the MAD of energized lines or equipment specified in Tables 1 through 6, as applicable.
- 33.3. The Contractor shall protect workers from hazardous voltages which may be present from various sources. They may include, but are not limited to the following:
- 33.3.1. 33.3.1 Power lines or other energized high voltage equipment by accidental contact as well as from “feedback” through station service or potential transformers.
- 33.3.2. 33.3.2 Induced voltages coupled from adjacent energized lines, from electrical charges carried by wind and dusts, etc. Contractors shall closely monitor and control the hazard of induced voltages
- 33.3.3. 33.3.3 Trapped electrical charges, such as in capacitors on transmission lines.
- 33.3.4. 33.3.4 Remote lightning. Note: PPGs may not provide complete personal protection for close-in strikes. Work shall be suspended and personnel shall stay in the clear during times that lightning is within sight or sound. Work will not resume for at least thirty (30) minutes after there has been no lightning or thunder.
- 33.4. All conductors and equipment shall be treated as energized until cleared, tested and grounded with a portable protective ground. No worker or equipment shall come within the Minimum Approach Distance MAD (Tables 1 through 6 as applicable) unless these provisions are met.
- 33.5. De-energized conductors and equipment which are to be grounded shall first be tested for voltage using approved methods.
- 33.6. A determination shall be made by the Contractor to ensure that hazardous step and touch voltages are not present when grounding lines for worker protection.
- 33.7. New lines or equipment may be considered de-energized and worked as such where:
- 33.7.1. 33.7.1 The lines or equipment are grounded, or
- 33.7.2. 33.7.2 The hazard of induced voltages is not present, and adequate clearances or other means are implemented to prevent contact with energized lines or equipment and the new lines or equipment.
- 33.8. Grounding
- 33.8.1. Portable Protective Grounds (PPG) shall be placed at such locations and arranged in such a manner as to prevent each worker from being exposed to hazardous differences in electrical potential.
- 33.8.1.1. If work is to be performed at more than one location in a line section:
- 33.8.1.1.1. That line section must be grounded and short circuited with the appropriate number of 2/0 portable protective grounds.

33.8.1.1.2. If work is to take place at a location other than where the AC three-phase short and grounds are, the conductor or equipment to be worked shall be grounded at the work site.

33.8.1.1.3. The MAD specified in Tables 1 through 6 as applicable shall be maintained from any ungrounded conductors or equipment.

33.8.2. When performing work at the structures, clipping crews and all others working on conductors, sub-conductors, or overhead ground conductors shall be protected by individual grounds (single-phase) installed on the conductor being worked on at each work location. A clipping crew shall have a minimum of two (2) structures clipped in between the crew and the conductor being sagged.

**34. Requirements for work on normally energized lines and equipment that are separated by an isolating device under the provisions of a Work Clearance.**

34.1. The Contractor shall not perform any work on any energized BPA high voltage conductors or equipment and shall not come within the MAD of energized lines or equipment specified in Tables 1 through 6 as applicable.

34.2. A Contractor will only perform work on normally energized BPA transmission lines under the protection of a Work Clearance. However, a Contractor may request, as an extra layer of protection, a Hold Order for work in proximity to energized lines and equipment when there is no intent or expectation that the MAD will be violated.

34.3. The Contractor shall protect workers from the hazards listed in section 33.3.1-33.3.4 of this document. In addition the Contractor shall protect workers from accidental energization due to the inadvertent closing of an isolating device.

34.4. BPA electrical workers will clear and tag the equipment. The Contractor shall then be issued a Clearance and, for the protection of its workers, properly install portable protective grounds at each work site.

34.4.1. The Clearance Holder shall identify all parts of the protective grounding circuit prior to the installation of portable protective grounds to ensure that a thorough understanding of the specific grounding circuit exists by all crew members prior to the start of work.

34.4.2. A visible AC three-phase short and ground shall be applied at each work site before any worker or equipment comes within the Minimum Approach Distance (MAD) of any de-energized line (as specified in Tables 1 through 6 as applicable).

34.4.3. A work site is defined as each specific location where a task is being performed. Portable protective grounds shall be installed as close to the work being performed as practical, and in such a manner as not to be disturbed during the course of the work. Care shall be taken to ensure that portable protective grounds are not placed where they may be inadvertently knocked off or damaged by the work process.

34.4.4. Any reference to portable protective grounds shall mean an adequate number of 2/0 copper ground leads or equivalent to effect, and maintain at all

times, a visible three-phase short and ground on the AC circuit. Visible short-circuiting may be accomplished through conductive parts of equal current carrying capacity as the protective grounds require, but shall not be effected through a ground grid or other concealed conductors. All portable protective grounds shall be installed and removed with approved "live-line tools".

- 34.5. Identification of PPGs - The Contractor shall employ an adequate PPG identification and inventory system to ensure that the location and status of each identified applied portable protective ground is positively accounted for and shall inform and give positive and documented assurance to the Clearance Holder and to the BPA COTR or the onsite BPA Representative of the status and location of each inventoried portable protective ground before releasing any Clearance.
- 34.5.1. Installation and Removal of Portable Protective Grounds (PPGs) – All ground leads from each ground set shall be connected at the ground end before any conductor end from that same ground set is connected to de-energized electrical parts.
- 34.5.2. Workers should avoid handling or contacting the ground lead while the conductor end is being installed or removed. During removal, all ground leads of each ground set shall be disconnected from the conductor end first. The conductor ends from that same set shall be moved to a point in the clear of the de-energized electrical parts before any ground lead from that same ground set is removed from the ground end.
- 34.6. In some cases it may be difficult to remove a ground lead with a live line tool (such as one installed during construction). In these cases, a second ground lead may be installed alongside the original one. The original one may then be removed by hand, and the second or remaining ground lead removed with a live line tool.
- 34.7. Portable protective grounds installed at multiple locations can cause circulating currents and hazardous voltages. These conditions can change due to line loading, weather, ground conditions and the installation and removal of additional grounds. The Contractor shall continuously monitor step and touch voltages and changing conditions as needed to ensure worker safety. When multiple crews are working on the same line section, direct radio connections shall be maintained between crews to monitor and measures taken to control such hazardous conditions.
- 34.8. Portable Protective Grounds (PPG) for each Clearance: Before workers or equipment contact or come within the MAD of a circuit, separate grounds shall be installed for each Clearance issued. When grounding overhead transmission lines grounding procedures and measuring of step-and-touch voltages shall be done in accordance with BPA TLM Standards and Guides I.A.2., Grounding, BPA Equipment and Structures; and I.A.3., Protection of Electrical Workers from Induced Currents and Voltages.
- 34.9. Ground Switches
- 34.9.1. The Clearance Holder shall be responsible for requesting the status of ground switches from the BPA Dispatcher and for ensuring that the ground switch position does not contribute to hazardous voltage conditions.
- 34.9.2. At no time shall a ground switch be considered a substitute for portable protective grounds.

- 34.10. Contractor Clearance Holder - All work carried out by a Contractor under a Work Clearance or Hold Order held by a Contract worker shall be governed by the provisions of the document "Contractor Clearance, Hold Order, and Work Permit Procedure", and "Transmission Line Maintenance Standards and Guides III.A.14 "Clearances on Line Sections", as well as this section of the contract Safety and Health Clause. The BPA Dispatcher shall have full authority to deny issuance of a Clearance or Hold Order to any Contract worker who, in the Dispatcher's opinion, has not adequately met or performed all the requirements contained in these documents. The Contractor shall accept full responsibility for the failure of its Clearance Holder to faithfully and accurately perform all the requirements stated therein or if the Clearance Holder is removed for cause under the provisions of this document. Multiple Clearance Holders may be required on the same project, depending on the situation. This will be determined by BPA on a case by case basis.
- 34.11. Workers shall be familiar with, know, and understand their responsibilities when working under a Clearance or Hold Order in accordance with the "Contractor Clearance, Hold Order, and Work Permit Procedure."
- 34.12. The Clearance Holder shall hold a detailed daily job briefing and hazard analysis for each crew working under the provisions of their Work Clearance or Hold Order. Any time conditions change, a new job briefing must be held with all affected crew members.
- 34.13. All projects restricted solely to pole and arm replacement (no conductor is being moved or replaced) shall be subject to the grounding provisions contained in this section and shall require the installation of an AC three-phase short and ground at each work location for worker protection.

### **35. Hand Lines and Rope Used in Energized Corridors**

- 35.1. The Contractor shall make every effort to ensure that hand lines and other rope used in energized corridors are maintained in as dry and clean a condition as possible in order to maintain a high resistance, dielectric condition. Hand lines and ropes shall not be left in work positions overnight.

### **36. Additional Grounding Requirements**

- 36.1. When attaching portable protective grounds, the ground end shall be attached first, and the conductor end shall be attached and removed using a live-line tool.
- 36.2. When removing portable protective grounds, the conductor end shall first be removed from the line or equipment using a live-line tool.
- 36.3. Workers shall avoid handling or contacting the ground lead while the conductor end is being installed or removed. During removal, all ground leads of each ground set shall be disconnected from the conductor end first. The conductor ends from that same set shall be moved to a point in the clear of all the de-energized electrical parts before any lead from that same ground set is removed from the ground end.

**Exception: On transmission towers where grounds are to be installed aloft, it is permissible to install or remove both ground and conductor ends on each phase prior to workers moving location. The conductor end shall be connected and disconnected with live-line tools.**

- 36.4. Portable Protective Ground (PPG) leads shall be attached to a tower ground, a grounding bar, or a driven ground, and shall be capable of conducting the anticipated fault current. All conductive parts in the work area that may be contacted during the course of the work shall be at the same potential and shall be tied to a common ground. Grounding parts shall have a minimum conductance of No. 2/0 AWG copper. Grounding for personal protection shall not be accomplished through vehicles, equipment, or rigging components.
- 36.4.1. Multiple (parallel) portable protective grounds may be required at some locations on the BPA power system when the anticipated fault current exceeds the capacity of a 2/0 copper ground set. When multiple portable protective PPGs are required, the grounding cables for each phase shall be of the same length and have the same type of ground end and conductor end clamps. These locations (if applicable) will be provided by BPA in the contract technical specifications.
- 36.4.2. Minimum requirements and procedures for assembly, maintenance and testing of portable protective grounds shall be in accordance with BPA Work Standard BPA-WS-6.4.
- 36.5. Before cutting or separating any part of the protective grounding circuit that could expose a worker to a possible difference of potential, the separated components shall be bonded together and tied to ground.
- 36.6. No disconnect switch, power circuit breaker, transformer\*, wave trap, fuse, or current limiting reactor shall be part of the protective grounding circuit.

\*Note: Does not apply to a visible single-turn primary such as in a "donut" CT circuit.

### **37. Grounds Portable Protective Grounds, Static Wire**

- 37.1. Before touching or coming within the MAD of any overhead static (ground) wire, unless an approved barrier is in place or the worker is insulated from any other exposed conductive object while conducting live-line bare hand work it must be grounded at that location by either a portable protective ground or a permanent ground connection. Except at 500 kV or above a portable protective ground must be installed. Some permanent overhead ground wire connections and/or conductors are subject to corrosion and vibration problems, resulting in a loss of conductivity. This is especially true on 500KV. (Note - Some overhead ground wires on the BPA system are insulated and energized at primary voltage to supply airway lighting circuits. A Clearance must be obtained and grounds installed before workers can come within the MAD of these lines.)
- 37.2. Portable Protective Grounding, (PPG), and Special Requirements: Multiple Portable Protective Grounds are required in many locations on the BPA system. They must be capable of carrying high magnitude fault current until the fault is cleared by protective relays and one or more power circuit breakers. The use of multiple portable protective Grounds protects workers from high magnitude faults which could cause a failure of a single PPG before the circuit is de-energized.
38. If not defined by the project specifications, Contractors should contact the BPA COTR to determine if multiple PPG's are required on specific BPA lines. BPA maintains a list of conductors which require multiple PPGs. The quantity of PPGs listed is the number of PPGs required per phase.

**39. 39.0 Stringing or removing conductor**

- 39.1. Prior to stringing operations a job briefing shall be held setting forth the plan of operation and specifying the type of equipment to be used and portable protective grounding procedures to be followed.
- 39.2. All pulling and tensioning equipment shall be isolated, insulated, or effectively grounded.
- 39.3. During stringing operations, each bare conductor, sub-conductor, and overhead ground conductor shall be grounded at the first tower adjacent to both the tensioning and pulling setups
- 39.4. These grounds shall be left in place until conductor installation is completed.
- 39.5. Such grounds shall be removed as the last phase of aerial cleanup.
- 39.6. Grounds shall be placed and removed with a live-line tool.
- 39.7. Each conductor, sub-conductor, and overhead ground conductor shall be grounded at all dead-end or catch-off points. Work on dead-end towers shall require grounding on all de-energized lines.
- 39.8. A ground shall be located at each side and within ten (10) feet of working areas where conductors, sub-conductors, or overhead ground conductors are being spliced at ground level. The two ends to be spliced shall be bonded to each other.
- 39.9. All conductors, sub-conductors, and overhead ground conductors shall be bonded to the tower at any isolated tower where it may be necessary to complete work on the transmission line.
- 39.10. Grounds may be removed as soon as the work is completed: Provided that the line is not left open circuited at the isolated tower at which work is being completed. (Grounds on an isolated line section shall not be removed until jumpers are closed.)
- 39.11. Contractors stringing over energized lines shall use tension stringing methods, guards, barriers, and/or other methods to positively prevent accidental contact with those lines. Contractors shall make arrangements to obtain either a Clearance or a Hold Order when crossing over or under any line energized in excess of 600 volts. Contract workers who are required to take Clearances or Hold Orders on foreign utility lines, or obtain a foreign utility Clearance or Hold Order through the BPA Dispatcher (as a result of a foreign utility's policy) for such proximity work must first obtain a BPA Term Contractor Certification. Qualified applicants must pass a test administered by BPA's Substation Operations Group.

**40. Grounding of Equipment, Tools, and Metallic Cables**

- 40.1. Power Lift Equipment: When a vehicle is parked near energized high-voltage equipment, there can be a risk of electric shock if contact is made between the vehicle and a grounded object. This is due to the capacitive charge that can build up on the vehicle. If the vehicle is to be bonded to a grounded object to prevent capacitive charge build-up, personnel must avoid getting in series with the discharge circuit.
- 40.2. Aerial lifts, cranes, booms, and any other overhead lift equipment working in proximity to energized lines or equipment shall be grounded with 2/0 AWG copper ground



cables. Multiple (parallel) grounds may be required at some locations on the BPA power system when the anticipated fault current exceeds the capacity of a 2/0 copper ground set. These locations (if applicable) will be provided by BPA in the contract technical specifications. When multiple portable protective grounds are required, the grounding cables shall be of the same length and have the same type of ground end and conductor end clamps.

- 40.3. Aerial lifts, cranes, and other overhead lift equipment is being used where the possibility of accidental contact with normally energized high voltage parts exist, shall be connected to the substation ground mat within energized switchyards, or with a ground rod in other locations with a 2/0 copper ground lead. Multiple ground leads, attached to separate ground rods or mat connections, shall be utilized on equipment in the same number that would be required for grounding the circuits.
- 40.4. Ground Mat Connected Equipment. If the possibility of contact with normally energized high voltage parts does not exist, power/lift equipment shall be grounded with a single 2/0 copper or static ground.
- 40.5 Equipment working within the MAD of normally energized grounded conductors or equipment shall be made at the same potential as the grounded conductor(s) or equipment being worked on. They shall be tied to a common ground to create an equipotential zone.

#### **41. Equipment and Rigging**

- 41.1. Shop made tools or equipment must be engineered, stamped with the W.L.L. (working load limit), and proof tested to 125% of the W.L.L. before being used in the field.
- 41.2. The Contractor shall assure that catch-off anchors (including temporary snubs), rigging and hoists shall be of ample capacity to prevent failures.
- 41.3. The Contractor shall have a program in place to adequately inspect all ropes, slings, rigging components and tools for damage or defects and follow applicable consensus standards and manufacturer recommendations for inspection and removal from service or repair.
- 41.4. Load lines shall not be detached from a tower section until the section is adequately secured. Unless otherwise designated by the COTR or the onsite BPA Representative, "adequately secured" shall be defined as 50% or more of the attaching bolts in place. Loads shall not be released until all tower legs are secured. Line workers shall not belt off to unsecured tower sections, and shall not climb on to unsecured tower sections. These provisions shall apply to all methods of tower erection.
- 41.5. Use of aerial lifts, manufactured hook ladders, platforms, or similar devices shall be considered approved methods for clipping or dead ending conductor, and related work processes. Crawling over insulators (suspension or dead end) shall not be considered an approved practice unless all of the following conditions are met:
  - 41.5.1. Alternate means were impractical or created a "greater hazard".
  - 41.5.2. 100% fall protection methods are used.
  - 41.5.3. A written hazard analysis has been completed by the Contractor showing that crawling over insulators is the safest or only practical way of completing a specific work task. Burden of proof would be on the Contractor in each specific case.



- 41.5.4. Climbing over dead end assemblies is permissible only after they have been completed and pinned in their final position.  
Clearances
- 41.6. Contractor Clearances taken on the BPA system or on foreign utility lines and equipment to facilitate the construction of BPA transmission lines will be accomplished in accordance with the documents titled "Contractor Clearance, Hold Order, and Work Permit Procedure", and Transmission Line Maintenance Standards and Guides III.A.14 "Clearances on Line Sections".
- 41.7. The Contractor will submit the resumes, including work experience and training history, of a minimum of two qualified line workers proposed to be certified as Clearance holders to the CO or COTR. Qualified line workers must meet the minimum qualifications identified previously in this clause.
- 41.8. The CO or COTR will schedule the training and written exam and notify the Contractor of the time and date. Training and written examination will require approximately eight (8) hours to complete and may be held at various locations in the BPA system.
- 41.9. A Contractor's Clearance Certification expires on January 31<sup>st</sup> of each year regardless of when the Certification was originally granted. Contractors shall immediately notify BPA's Substation Operations Group when a worker that holds a current Clearance Certification is no longer employed by that Contractor. The Substation Operations Group will deactivate the workers Clearance Certification. If the individual is rehired by a contractor doing work for BPA, the workers Clearance Certification may be reactivated at the request of the Contractor provided the request is made within the present Clearance Certification Cycle.
- 41.10. Concurrent Clearances occur when two or more qualified electrical workers are issued clearances with the same clearance limits on a transmission line and/or its terminal equipment. This could include contract electrical crews working in conjunction with BPA electrical crews. The safety of BPA employees and Contractors must be of high priority during these times of integrated work and outages. When a contract requires Concurrent Clearances, the following BPA Work Standards will be included in Contract Documents and the procedures shall be followed:
- BPA WS-10-14. Communications during Concurrent Work Clearances with Contractors
  - BPA WS-6-3 and 7. Multiple Clearance Hazards (Grounding & Bonding)

## **CHAPTER 4 – COMMERCIAL AVIATION SERVICES (NON-TRANSPORTATION)**

### **42. Commercial Aviation Services (CAS) General -- Applicable to ALL CAS Operations**

- 42.1. The contractor has sole responsibility for the airworthiness, operation and safety of the aircraft operations and the public during the conduct of operations.
- 42.2. An aircraft is defined by the FAA as a device that is used or intended to be used for flight in the air. A drone/UAS/UAV is classified as an aircraft by the FAA.
- 42.3. Aircraft vendors performing work under this contract must comply with the applicable Federal Aviation Regulations reference Title 14 CFR, Chapter 1, 49 CFR, Chapter XII, and 49 CFR Subchapter C, and/or DOT Special Permit(s) or exemptions and must comply with the “civil aircraft” regulations applicable to the type of operations conducted while in service to the Bonneville Power Administration. BPA has made a declaration to the FAA that aircraft operations for BPA are “civil aircraft” and not “public aircraft” at any time while in service to BPA under this contract.
- 42.4. All CAS vendors must be accepted by BPA’s Aircraft Services or DOE prior to performance of any work on BPA’s power system or property.
  - 42.4.1. An initial assessment, and thereafter every two (2) years if a continuing need exists, will be made by the Aircraft Service Manager, their designee or Department of Energy (DOE) aviation consultant to ensure that the contractor meets the qualifications for this contract.
  - 42.4.2. The assessment will be conducted on-site at the contractor’s facility, where Bonneville Aircraft Services, their designee or the Department of Energy (DOE) aviation consultant will need access to the Contractor’s General Operations Manual, General Maintenance Manual (if applicable), Safety Management System document, aircraft maintenance and inspection records, pilot training records, and key management personnel.
  - 42.4.3. In lieu of paragraphs 42.3.1 and 42.3.2, if the contractor produces documentation they are listed as approved for use under the Department of Defense (DOD) Commercial Air Transportation Quality and Safety Review Program or Aviation Resource Group/United States (ARG/US) or Wyvern, then the on-site assessment of paragraph 42.3.1 may be waived.
- 42.5. The Contractor must perform, and record, weight and balance calculations prior to flight to ensure that aircraft are within the manufacturers and FAA established weight and balance limitations for each operation, flight, or mission profile for which the aircraft are to be operated. Unless otherwise approved by the FAA, actual weights shall be used for the weight and balance calculations.
- 42.6. The contractor will only provide aircraft maintained, airworthy and safe for the intended operation in accordance with an FAA maintenance and inspection regulations 14 CFR Parts 21, 43, §91.409, 133 or the Contractor’s FAA Part 133 Operations Specifications and/or 135, if Part 135 is applicable

- 42.7. The Contractor is required to submit quarterly reports of flight hours, costs, and other relevant information to the Bonneville Aircraft Service's Manager or designee as required by Federal Management Regulation or successor regulation promulgated by Government Service Administration (GSA).

The report must include:

- 42.7.1. Agreement Start date:
- 42.7.2. Agreement End Date:
- 42.7.3. Aircraft Manufacturer:
- 42.7.4. Aircraft Model:
- 42.7.5. Vendor Name:
- 42.7.6. Vendor Location:
- 42.7.7. Registration #:
- 42.7.8. Costs:
- 42.7.9. Flight Hours:
- 42.7.10. Mission Description:

The report dates are: January 15, April 15, July 15, and October 15.

Note: This reporting requirement is applicable to any aircraft operations either by the contractor or their sub-contractor.

- 42.8. Contractors that operate under 14 CFR part 135 shall comply with the Pilot Records Improvement Act of 1996 (PRIA) and shall have a DOT/FAA approved drug and alcohol program in place covering all pilots and ground support personnel. If an operator is conducting aerial work under 14 CFR Part 91 or only certified to operate under 14 CFR Part 133, then the company should have a company drug and alcohol program in place covering all pilots, mission crew and ground support personnel.
- 42.9. To mitigate the potential for mid-air collision with other BPA aircraft, when the aircraft operation requires flight within or along a BPA right-of-way or to and from BPA facilities the CAS Vendor must:

Prior to Flight:

- 42.9.1. Contact Dittmer Dispatch at 360-418-2281 or 800-392-0816
- 42.9.2. Provide the company name and aircraft registration number
- 42.9.3. Purpose of flight (Transportation, aerial survey, power line patrol, etc.)
- 42.9.4. Departure location with estimated time of departure
- 42.9.5. Destination

- 42.9.6. Route of flight or name of power line (e.g. John Day – Grizzly #1 500 kV line)
- 42.9.7. Estimated time of arrival or completion of work
- 42.9.8. Provide Contractor contact's name and phone number (must be available at all times during aircraft usage)

Upon completion of flight:

- 42.9.9. Contact Dittmer Dispatch at 360-418-2281 or 800-392-0816
- 42.9.10. Notify Dispatch that air operations are complete

**This requirement in paragraph 42.8 does not relieve the Contractor from their responsibility to adhere to the vendor's flight locating procedures.**

- 42.10. The Contractor should have implemented an Integrated Safety Management System, which is subject to review by Bonneville Aircraft Services.
- 42.11. The Contractor shall notify immediately the Bonneville Aircraft Services' Manager/Director of Operations, or Chief Pilot or designee if while in service to BPA an aircraft accident, incident, or FAA violation occurs.
- 42.12. Aircraft equipped with position tracking devices shall have the device functional during the times they are working for Bonneville, or on Bonneville property.

#### **43. Airplane Services (Non-Transportation)**

- 43.1. Airplane(s) supporting BPA construction or maintenance activities may be used for any of the following: aerial surveys, LiDAR data acquisition and aerial photography. The personnel being transported during these airplane operations must be essential to or directly associated with the aircraft operation.
- 43.2. These airplane operations are considered aerial work and performed under the provisions applicable to civil aircraft in accordance with 14 CFR Parts 21, 39, 43, 45, 47, 61, 91 and 119.
- 43.3. Aircraft Maintenance programs.
  - 43.3.1. The contractor must provide aircraft that have completed an annual inspection and been approved for return to service in accordance with 14 C.F.R. Part 43, and the manufacturers approved inspection program or an FAA accepted/approved alternative method of inspection (e.g. AAIP)
  - 43.3.2. The contractor must comply with the mandatory replacement times, inspection intervals, and related procedures specified in the manufacturer's maintenance manual or instructions for continued airworthiness applicable to the make and model of aircraft, OR
  - 43.3.3. Comply with the section or alternative inspection intervals and related procedures set forth in the operator's FAA approved maintenance program defined in 14 CFR Part 91.409 or if applicable the vendor's FAA Operations Specifications or International Aviation Authority's equivalent.

- 43.3.4. Must follow Instructions for Continued Airworthiness instructions for additional equipment and modifications to the aircraft.
- 43.3.5. Must comply with all applicable Airworthiness Directives to the make and model of aircraft and engines, and propellers.
- 43.4. A flight and duty hours schedule meeting the following minimum requirements:
  - 43.4.1. Maximum flight time while performing aerial surveys shall be limited to eight (8) hours in each twenty-four (24) hour period; except that an exceedance of eight (8) hours flight time may be allowed by permission of the BPA Aircraft Services Manager to complete a specific mission or for an emergency flight.
  - 43.4.2. Each pilot shall be provided one rest day twenty-four (24) hours) in every seven (7) day period or two rest days shall be provided in every fourteen (14) day period.
  - 43.4.3. The pilot must have ten (10) hours of uninterrupted rest prior to initiating flight operations each workday while operating for BPA.
- 43.5. No vendor shall operate an airplane, except when necessary for takeoff or landing, below the following altitudes:
  - 43.5.1. Anywhere. An altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface.
  - 43.5.2. Over congested areas. Over any congested area of a city, town, or settlement, or over any open air assembly of persons, an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.
  - 43.5.3. Over other than congested areas. An altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure.
- 43.6. All CAS vendor airplane pilots must meet the following minimum qualifications:
  - 43.6.1. Possess a current FAA Airline Transport Pilot or Commercial Pilot Certificate with a Single-Engine Land class with instrument rating or if applicable multi-engine land class with instrument rating..
  - 43.6.2. Possess a current FAA Class I or II Medical Certificate.
  - 43.6.3. Assigned as pilot-in-command under the Contractor's training program.
  - 43.6.4. Qualified and current under the Contractor's training program.
  - 43.6.5. Meets the proficiency requirements of Part 61 and 91.
  - 43.6.6. Must have 200 hours in the category and class of aircraft being flown on the contract, and currency in the make and model being flown.

- 43.6.7. Must be knowledgeable and familiar with guidance and hazards identified in the Helicopter Association International's Utilities, Patrol and Construction Guide Chapters 1 – 7.
- 43.6.8. Must have completed the CAS vendors FAA or International aviation authority equivalent approved initial, recurrent or qualification training program in the previous twelve (12) months.

#### **44. Helicopter Services – (Non-Transportation) General Requirements**

- 44.1. Aircraft vendors performing work under this contract must be certified under the applicable Federal Aviation Regulation reference 14 CFR Parts 119, 133 and/or 135 and comply with the vendor's FAA issued part 133 and/or 135 Operation Specifications and FAA approved Rotorcraft Load Combination Flight Manuals and if applicable, the vendor's FAA accepted General Operations Manual.
- 44.2. Class B HEC operations may be authorized by BPA's Aircraft Services Manager. The vendor must demonstrate through documentation the vendor's pilot(s) and workers are trained in these techniques and the aircraft equipment includes the use of a personal safety device (belly band) during these operations.
- 44.3. All CAS vendor helicopter pilots must meet the following minimum qualifications:
  - 44.3.1. Possess a current FAA Airline Transport Pilot or Commercial Pilot Certificate with a Rotorcraft/Helicopter Rating.
  - 44.3.2. Possess a current FAA Class I or II Medical Certificate.
  - 44.3.3. Assigned as pilot-in-command under the Contractor's Part 91, 133 and/or 135 programs.
  - 44.3.4. Qualified and current under the Contractor's FAA Part 133 and/or 135 programs.
  - 44.3.5. Meets the proficiency requirements of Part 61, 133 and/or 135.
  - 44.3.6. Must have 200 hours (or as required by the level of pilot certificate possessed) in the category and class of aircraft being flown on the contract, and currency in the make and model being flown.
  - 44.3.7. Must be knowledgeable and familiar with guidance and hazards identified in the Helicopter Association International's Utilities, Patrol and Construction Guide Chapters 1 – 7.
  - 44.3.8. Should have attended a formal pilot training program (i.e. factory school such as Sikorsky, Bell, Eurocopter, McDonnell Douglas, etc.) for the model of aircraft being contracted or the contractors approved FAR 135 training program.
  - 44.3.9. Must have completed the CAS vendors initial, recurrent or qualification training program in the previous twelve (12) months.
  - 44.3.10. Completed a "flying in the wire" environment training course within the preceding 24 months.

**44.4. Helicopter Maintenance programs.**

44.4.1. The contract aircraft must comply the mandatory replacement times, inspection intervals, and related procedures specified in the manufacturer's maintenance manual or instructions for continued airworthiness applicable to the make and model of aircraft, OR

44.4.2. Comply with the section or alternative inspection intervals and related procedures set forth in the operator's FAA approved maintenance program defined in 14 CFR Part 91.409 or if applicable the vendor's FAA Operations Specifications or International Aviation Authority's equivalent.

44.4.3. Must follow Instructions for Continued Airworthiness instructions for additional equipment and modifications to the aircraft.

44.4.4. Must comply with all applicable Airworthiness Directives to the make and model of aircraft and engines, and propellers.

44.4.5. All maintenance must be recorded and been approved for return to service in accordance with 14 C.F.R. Part 43 or the contractor's FAA Approved Aircraft Inspection Program.

44.5. No vendor shall operate a helicopter, except when necessary for takeoff or landing, below the following altitudes:

44.5.1. Anywhere. An altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface.

44.5.2. External load operations over/within a congested area must have an FAA approved Congested Area Plan and a copy of that approved plan provided to BPA Aircraft Services.

44.6. A minimum ceiling and visibility shall be established by the Contractor prior to initiating work that ensures safety during operations.

44.7. The vendor will ensure during all Class A and B external load operations that all workers can communicate either by radio or combination of hand and head signals during the external load operation. Loss of communication or lack of understanding between the pilot and workers as to the meaning of the hand and head signals will require the work to stop, until effective communications are re-established.

**45. Helicopter Services – Aerial Survey Operations (Non-Electrical Contractors) (14 CFR Part 91)**

45.1. Helicopter(s) supporting BPA construction or maintenance activities may be used for any of the following aerial survey operations: aerial photography, aerial surveys, or LiDAR data gathering. The personnel being transported during these rotorcraft operations must be essential to or directly associated with the aircraft operation.

45.2. The Contractor will only provide aircraft that are airworthy and safe for the intended operation and maintained under a FAA approved maintenance program defined in 14 CFR Part 91.409.

45.3. A flight and duty hours schedule meeting the following minimum requirements:



- 45.3.1. Maximum flight time while performing aerial surveys shall be limited to eight (8) hours in each twenty-four (24) hour period; except an exceedance of eight (8) hours flight time for single pilot operations may be allowed by permission of BPA's Aircraft Services Manager to complete a specific mission or for an emergency flight.
- 45.3.2. Each pilot shall be provided one rest day in every seven (7) day period or two rest days shall be provided in every fourteen (14) day period.
- 45.3.3. The pilot must have ten (10) hours of uninterrupted rest prior to initiating flight operations each workday while operating for BPA.

#### **46. Helicopter Services – Construction/Repair External Load Work (14 CFR Part 133)**

- 46.1. Helicopter(s) supporting BPA construction activities may be used for any of the following operations: rotorcraft load combinations including Class A, B or C loads. The personnel being transported during these rotorcraft load combinations must be essential to or directly associated with the aircraft and construction activities.
- 46.2. All rotorcraft external load operations must use a FAA approved load attachment means and the load carrying devices must meet industry standards
- 46.3. All CAS vendor helicopter pilots must meet the following minimum qualifications in addition to those in 44.3:
  - 46.3.1. Must have 200 documented hours or more of vertical reference long line experience.
  - 46.3.2. Have received briefings or training on induced voltage hazards and other electrical hazards when working in a high voltage environment.
- 46.4. When helicopters are used to land tower sections or poles or cross arms, the following shall apply:
  - 46.4.1. When landing a tower section load in an elevated position, a positive guide and positioning system shall be used. Fabricated temporary load carrying devices must be designed and stamped by a Professional Engineer and shall be of sufficient strength to safely support the specific load calculated for each load placement. Working Load Limits must be posted and visible on all lifting devices.
  - 46.4.2. Qualified workers may work under a hovering helicopter only to guide and temporarily secure loads, and to attach or disengage load lines.
  - 46.4.3. Loads shall not be released until all tower legs, pole or cross arms are secured. Line workers shall not belt off to unsecured tower sections or cross arms, and shall not climb on to unsecured tower sections, pole, or cross arms.
  - 46.4.4. A maximum wind speed shall be established by the Contractor and before the start of each project or lift, based on the effect of wind on the load and helicopter load capacity using standard formulae. Wind speed shall be monitored and helicopter external load operations shall cease when this limit is reached.

- 46.5. When performing external load work, the Contractor shall submit for review by BPA's Aircraft Services at least ten (10) business days in advance of any proposed flight operations:
- 46.5.1. A job specific Job Hazard Analysis (JHA) that shall include hazard mitigations for the specific type of structures and work to be performed. When working in energized corridors or double circuit structures where a circuit remains energized, the JHA shall detail specific procedures to assure that the applicable MAD is maintained by the helicopter and all attachments including a procedure to account for wind and other conditions.
  - 46.5.2. When a congested area plan is required by FAR 133 the Contractor shall be responsible for preparation and submittal for approval to the FAA in advance of the lift. A copy shall be available to BPA Aircraft Services at their request.
  - 46.5.3. A flight duty hours schedule meeting the following minimum requirements:
    - 46.5.3.1. Maximum flight time while performing external load work shall be limited to six (6) hours in each twenty-four (24) hour period for single pilot operations and eight (8) hours in each twenty-four (24) hour period for aircraft requiring two pilots; except that a maximum of eight (8) hours flight time for single pilot operations may be allowed by permission of the Aircraft Services Manager to complete a specific mission or for an emergency flight.
    - 46.5.3.2. Each pilot shall be provided one rest day in every seven (7) day period or two rest days shall be provided in every fourteen (14) day period.
    - 46.5.3.3. The pilot must have ten (10) hours of uninterrupted rest prior to initiating flight operations each workday while operating for BPA.
- 46.6. When performing any Class C external load operations, including sock line pulls, the CAS vendor shall ensure that:
- 46.6.1. All puller-tensioners used for pulling line with a helicopter shall be used in the free-wheel mode only and shall have a braking system adequate to achieve tension necessary to maintain needed control of the line.
  - 46.6.2. If a breakaway device is used in conjunction with a helicopter line pull, the CAS vendor shall ensure that:
    - 46.6.2.1. All personnel remain in the clear to protect them from any hazard in the event of an inadvertent breakaway.
    - 46.6.2.2. The breakaway device is inspected before each pull. If damage is suspected the shear-pin must be replaced.
    - 46.6.2.3. Vendor's operating helicopters, such as the MD 500, 600 or 900 models, that are subject to fuel starvation due to a combination of bank and pitch angles experienced during Class C load operations will establish the following minimum fuel state for the pilot to stop the Class C operation. The limits are:
      - (a) 150 pounds indicated on the aircraft's fuel gauge, as viewed in level flight, or

- (b) No less than 250 pounds (approximately 36 gallons) in the fuel tanks of the aircraft.

46.7. When performing any Class B external load operations, the CAS vendor shall ensure that:

46.7.1. All long lines are non-conductive material and provide for adequate clearance twenty (20) feet minimum from any infrastructure including towers, conductors, overhead ground wires or terrain features such as trees) for the operation being conducted.

46.7.2. When external load operations are conducted in the wire environment involving an interaction with workers, except for tower or pole placements, an electrically activated remote hook should not be used, due to the potential of induced voltage to the worker that may result in injury.

#### **47. Helicopter Services – Heli-saw Operations**

47.1. Helicopter(s) supporting BPA vegetation management activities may be used for rotorcraft load combinations including Class B loads heli-saw or heli-tree trimming. The personnel being transported during these rotorcraft load combinations must be essential to or directly associated with the aircraft operation. All rotorcraft external load operations must use a FAA approved load attachment means and the load carrying devices must meet industry standards

47.2. Comply with all applicable industry consensus safety standards relating to tree and brush cutting, pruning and trimming in proximity to energized high voltage lines.

47.3. All CAS vendor helicopter pilots conducting Heli-saw Operations must meet the following minimum qualifications in addition to those in 44.4:

47.3.1. Must have 200 hours or more of vertical reference long line experience.

47.3.2. Pilot-in-command must have fifty (50) hours or more of aerial tree trimming experience with the make and model of aerial saw and helicopter within the previous twelve (12) months.

47.4. Must have completed the CAS vendors Part 133 initial, recurrent or qualification training program in the previous Twelve (12) months.

47.5. A maximum wind speed shall be established by the Contractor and before the start of each project or lift, based on the effect of wind on the load and helicopter load capacity using standard formulae. Wind speed shall be monitored and helicopter lifting operations shall cease when this limit is reached.

47.6. When performing external load work, the Contractor shall submit for review by BPA's Aircraft Services at least ten (10) business days in advance of any proposed flight operations:

47.6.1. A job specific Job Hazard Analysis (JHA) that shall include hazard mitigations for the specific type of structures and work to be performed. When working in energized corridors or double circuit structures where a circuit remains energized, the JHA shall detail specific procedures to assure that the applicable MAD is maintained by the helicopter and all attachments

including a procedure to account for wind and other conditions (See attachment 1).

- 47.6.2. When a congested area plan is required by FAR 133 the Contractor shall be responsible for preparation and submittal for approval to the FAA in advance of the lift. A copy shall be available to BPA's Aircraft Services Manager at their request.
- 47.6.3. A flight and duty hours schedule meeting the following minimum requirements:
- (a) Maximum flight time while performing aerial tree trimming external load work shall be limited to four (4) hours in each twenty-four (24) hour period; except that a maximum of six (6) hours flight time may be allowed by permission of the pilot and BPA Aircraft Services Manager to complete a specific mission.
  - (b) Maximum flight time including aerial tree trimming and ferry time is eight (8) flight hours in any twenty-four (24) hour period.
  - (c) Each pilot shall be provided one rest day in every seven (7) day period **or** two (2) rest days shall be provided in every fourteen (14) day period.
  - (d) The pilot must have ten (10) hours of uninterrupted rest prior to initiating flight operations each work day while operating for BPA.

#### 47.7. Daily Job Briefings

- 47.7.1. The Contractor shall conduct a daily job briefing each morning with safety as an integral part of the briefing. The Contractor shall maintain written documentation of daily job briefings using BPA form 6410.32e or an equivalent form approved by BPA. These reports shall be made available to BPA upon request.

Each briefing shall include the following:

- (a) Identify the line(s), the line voltage, and the appropriate minimum approach distance (MAD).
- (b) Identify the specific work methods that will be used to prevent a violation of the MAD by contractor personnel on this project or release.
- (c) Identify the qualified personnel needed to safely complete the work.
- (d) Identify if a Clearance or Hold Order will be required to safely conduct the work on each specific release or project.
- (e) Identify any other hazards recognized by the contractor after an inspection of the work area and how those hazards will be mitigated or controlled.
- (f) All required PPE shall be reviewed.

#### 47.8. Communications

47.8.1. The Contractor shall ensure that field supervision maintains a reliable method of emergency communications from all right-of-way work areas in the event of accident or illness.

47.8.2. The Contractor shall ensure that field supervision maintains reliable communications at all times with the BPA Clearance Holder when working under the protection of a Clearance or Hold Order.

#### 47.9. Minimum Approach Distance (MAD)

47.9.1. The Contractor shall not perform any work on energized BPA high voltage conductors or equipment and shall not come within the Minimum Approach Distances MAD of energized lines or equipment except under the provisions of a Work Clearance.

47.9.2. All conductors and equipment shall be treated as energized unless the contractor has been informed by a qualified BPA Clearance Holder at their work site that the line or equipment is de-energized and cleared for the contractor to perform their work.

#### 47.10. Minimum Approach Distance (MAD) Charts

47.10.1. Refer and adhere to Charts and Tables in Chapter 5.

## CHAPTER 5 – VEGETATION MANAGEMENT

### 48. Job Hazard Analysis (JHA)

- 48.1. The Contractor shall prepare, implement and enforce a JHA for each contract or Master Agreement.
- 48.2. Prior to the start of any on-site work for each contract or Master Agreement, the Contractor shall submit to BPA for review a JHA to identify and mitigate any recognized hazards or conditions applicable to the type of work involved. Site and adjacent conditions shall be considered. The Contractor shall “walk down” the work areas to evaluate for location-specific hazards and the need for additional/different controls. (See Attachment 1, Job Hazard Analysis Submittal Instructions)
- 48.3. The Job Hazard Analysis (JHA) shall be available to all workers at the work site. All workers must be familiar with the content of the JHA. The JHA shall be available for review by BPA employees upon request.
- 48.4. All safety issues shall be resolved prior to the start of work. The Contractor will not be allowed to begin work until the Contracting Officer issues a written notice-to-proceed.
- 48.5. The Contractor shall ensure that all safety and health provisions and requirements are followed by their subcontractors, suppliers, and support personnel and that all workers working on the project are knowledgeable of the provisions of the Job Hazard Analysis (JHA).
- 48.6. The Contractor shall comply with all applicable industry consensus safety standards relating to tree and brush cutting, pruning and trimming in proximity to energized high voltage lines.

### 49. Daily Job Briefings

- 49.1. The Contractor shall conduct a daily job briefing each morning with safety as an integral part of the briefing. Job briefings shall be held at the work site with additional briefings conducted when work situations changes, that may pose different or additional hazards to workers. The Contractor shall maintain written documentation of daily job briefings using BPA form 6410.32e or an equivalent form approved by BPA. These reports shall be made available to BPA upon request.

Each briefing shall include the following:

- 49.1.1. Identify the line(s), the line voltage, and the appropriate Minimum Approach Distance (MAD).
- 49.2. Identify any trees or brush on each project or release that if felled, could violate the Minimum Approach Distance (MAD). Identify specific methods or tools that will be used to determine the potential for trees to fall within the MAD.
  - 49.2.1. Identify the specific work methods that will be used to prevent a violation of the MAD by contractor workers on this project or release.
  - 49.2.2. Identify the qualified personnel needed to safely complete the work. All work conducted where “an electrical hazard exists” shall be performed by qualified line clearance tree trimmers. Trainees shall work under the direct supervision of a qualified line clearance tree trimmer.

49.2.3. Identify if a Clearance or Hold Order will be required to safely conduct the work on each specific release or project.

49.2.4. Identify any other hazards recognized by the contractor after an inspection of the work area and how those hazards will be mitigated or controlled. Note- this inspection and hazard analysis must be done by a qualified line clearance tree trimmer “when an electrical hazard exists.”

49.3. All required PPE shall be reviewed.

## 50. Minimum Qualifications for Contractor Workers

50.1. The pruning, trimming, repairing, maintaining, removing, treating, or clearing of trees or the cutting of brush that is within the Minimum Approach Distances (MAD), specified in Table 8, of electrical lines or equipment shall be performed by qualified line clearance tree trimmers.

50.2. The Contractor shall ensure and be able to document that all qualified line clearance tree trimmers working on this project or release meet the following minimum qualifications:

50.2.1. Be certified as having completed a program consisting of both coursework and supervised on-the-job training under a recognized line clearance tree trimmer training program. This program shall include **at a minimum**, the safety and training requirements outlined in OSHA 1910.269(r), ANSI Z133.1, and applicable State standards.

50.2.2. Have completed **at least** thirty-five (35) hours of requisite coursework and two (2) years of supervised on-the-job training. This shall include at least six (6) months documented experience cutting trees in proximity to energized high voltage lines operated at 50 kV and above.

50.2.3. Have documented at least one 1 year experience felling trees over 40 feet in height and greater than 8” diameter.

50.2.4. Have documented experience felling trees greater than 20” diameter.

50.2.5. Have a current First Aid/CPR/AED card.

50.2.6. Have fluency in the English language as well as the language(s) of contractor workers under their supervision.

50.3. The Contractor shall make available, upon request by the CO or authorized representative of the CO, documentation verifying worker qualifications.

50.3.1.

50.4. Company Requirements

50.4.1. Recordkeeping that is current for all employees, and includes all certifications, and training classes completed.

50.4.2. Company Manual with printed protocol for becoming a new hire, an apprentice, and a QLCTT journeyman.



- 50.4.3. Annual internal safety training, 4 hour minimum required
- 50.4.4. Provide certificates and attestations to the BPA Contracting Officer annually, by January 1<sup>st</sup> of each year.

## 51. Minimum Crew Size

- 51.1. When climbing any tree where any portion of the tree, work tools, or equipment can enter Zone B (see subsection 58 of this contract clause for Zone B definition), a second qualified worker/line clearance tree trimmer equipped with a second set of climbing tools shall be available on the job.
- 51.2. When a qualified worker is climbing a tree and working above twelve (12) feet in height, a second qualified worker equipped with a second set of climbing tools shall be available on the job that is trained and knowledgeable in rescue methods.
- 51.3. All crews performing work where an electrical hazard or a violation of the MAD could occur shall have **a minimum** of one qualified line clearance tree trimmer per crew. Depending on site and job conditions, the contract may require a greater number.
- 51.4. There shall be sufficient qualified personnel on each crew to adequately supervise the work of trainees working on that crew at each work location.

## 52. Equipment and Rigging

- 52.1. All rigging or equipment used to control a tree's fall shall be adequately anchored, sized and positioned to control the weight of the tree and positively control the direction of fall.
- 52.2. When using rigging to pull "leaners" over center, mechanical methods shall be employed and sized appropriate to the weight and position of the tree.
- 52.3. The Contractor shall have a program in place to adequately inspect all ropes, slings, rigging components and tools for damage or defects and follow applicable consensus standards and manufacturer recommendations for inspection and removal from service or repair.

## 53. Tree Falling

- 53.1. The safety of the Contractor's workers and the public, and the integrity of the BPA system shall be the Contractor's primary considerations when felling trees on energized right-of-ways. If a conflict or question arises over proper procedure, the safest, most stringent or most conservative interpretation shall initially apply and the CO, COTR or the onsite BPA Representative shall be contacted to resolve the issue.
- 53.2. At no time shall it be considered acceptable to fall trees on BPA lines, equipment or structures whether they are energized or de-energized. All Zone A or B trees shall be directionally felled away from transmission lines and towers using methods appropriate to **ensure** the direction of fall.
- 53.3. **Additional** methods of mechanical control shall be used to safely and positively control the direction of fall whenever:
  - 53.3.1. Lodged trees are encountered. (Domino falling shall not be considered an adequate method of positive control.)

- 53.3.2. Wind or other conditions make directional falling dangerous or uncertain. (or work shall be temporarily suspended until conditions improve)
- 53.3.3. Decay, rot or other weak spots are present or suspected.
- 53.3.4. A clear falling path cannot be ensured.
- 53.4. A clear falling path shall be assured or:
  - 53.4.1. The tree shall be felled under the protection of a Clearance or:
  - 53.4.2. Positive control shall be maintained by mechanical equipment or:
  - 53.4.3. The tree shall be climbed and pieced out.
- 53.5. A safe work zone and escape path shall first be created before a tree is fell.
- 53.6. Sufficient hinge wood shall be left to hold the tree to the stump during its fall and to guide the intended direction of fall.

#### **54. Flammable Liquids**

- 54.1. Cutters shall not carry portable containers containing flammable liquids on their person.

#### **55. Fall Protection**

- 55.1. Contractors performing work over four feet above ground shall use fall protection that meets applicable consensus standards. Belay lines and other climbing lines and equipment used for worker fall protection shall be inspected before each use, properly stored and maintained exclusively for climbing purposes, and not used for rigging.
- 55.2. The Contractor shall ensure that only qualified workers trained and experienced in fall protection, rescue and other safe aerial work practices and procedures shall be permitted to climb or perform aerial work under this contract. The contractor shall make periodic assessments and observations to ensure worker skills are adequate. Documentation of these assessments shall be made available to BPA upon request.

#### **56. Lockout/Tagout (LOTO)**

- 56.1. The Contractor shall ensure that no workers are exposed to injury from the unexpected or accidental startup or release of stored energy of equipment or machinery that is shut down for repair, maintenance or adjustment.
- 56.2. All adjustments, cleaning and repairs that could pose a hazard shall not be performed on a running engine. "Hot refueling" is strictly prohibited.

#### **57. 56.0 Communications**

- 57.1. The Contractor shall ensure that field supervision maintains reliable communications at all times with the BPA Clearance Holder when working under the protection of a Clearance or Hold Order.

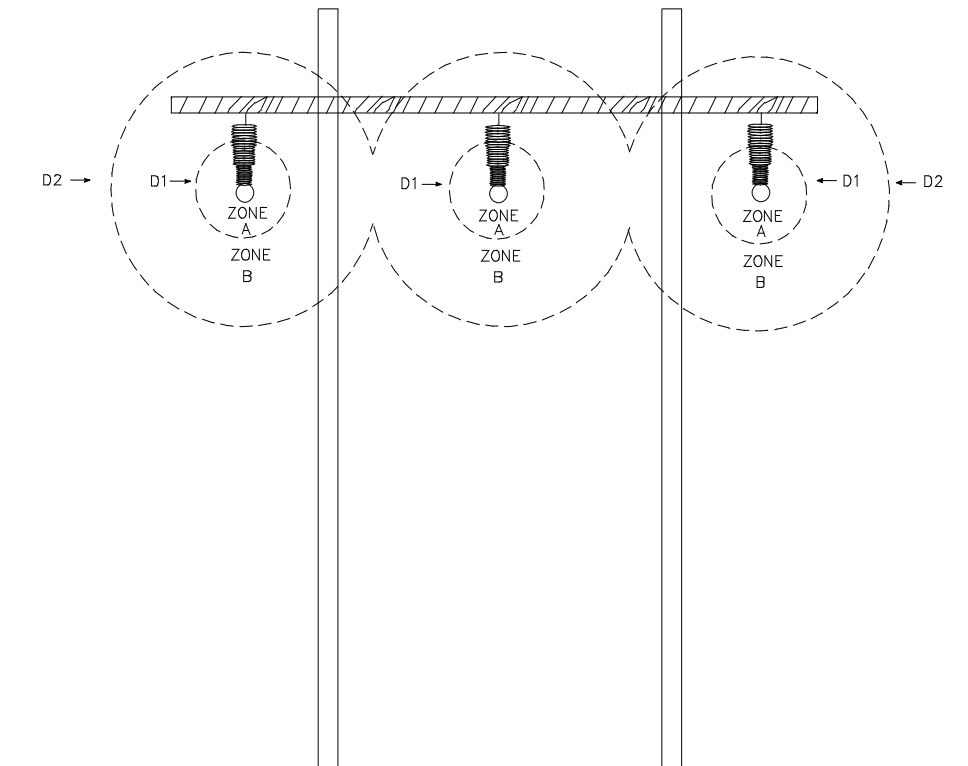
#### **58. 57.0 Minimum Approach Distance (MAD)**

- 58.1. The Contractor shall not perform any work on energized BPA high voltage conductors or equipment and shall not come within the MAD of energized lines or equipment except under the provisions of a Work Clearance.
- 58.2. All conductors and equipment shall be treated as energized **unless** the contractor has been informed by a qualified BPA Clearance Holder at their work site that the line or equipment is de-energized and cleared for the contractor to perform their work.
- 58.3. When applying herbicide, all overspray shall be considered as conductive. Wind and other conditions shall be taken into account to ensure that the MAD is not violated by overspray or equipment.

**59. Minimum Approach Distance (MAD) Charts and Tables**

**D1 (distance 1)** – Minimum Approach Distance for Qualified Line-Clearance Tree Trimmer (see Table 7)

**D2 (distance 2)** – Minimum Approach Distance for all other tree workers (see Table 8)



**Zone A** – Inside the Minimum Approach Distance (MAD). Any trees or work completed in this zone **requires an outage** (Clearance), and the workers shall be qualified line clearance tree trimmers or under the direct supervision of qualified line clearance tree trimmers.

**Zone B** – If the tree or trees are in this zone, or if there is any potential of the tree, its branches, or tools entering this zone, the workers shall be **qualified line clearance tree trimmers**. A Hold Order may be required for work in this zone<sup>1</sup>.

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<sup>1</sup> A Hold Order is required when falling or removing danger trees if an electrical hazard (or a violation of the MAD) could result. The contractor has the responsibility of determining hazard trees and the need for a Hold Order.

59.1. TABLE 7 – Minimum Approach Distance (MAD) from Energized Conductors for Qualified Line Clearance Tree Trimmers

<b>Table 7: MAD from Energized Conductors for Qualified Line Clearance Tree Trimmers – All Elevations</b>	
<b>Nominal Voltage (Phase-to-Phase)</b>	<b>MAD without Hold Order (ft-in)</b>
51 – 300 V	Avoid Contact
750 V	2'-1"
15 kV	2'-9"
34.5 kV	3'-5"
46 kV	3'-10"
69 kV	4'-9"
115 kV	5'-2"
138 kV	5'-11"
161 kV	6'-10"
230 kV	9'-0"
287 kV	11'-3"
345 kV	15'-0"
500 kV	21'-9"
<b>NOTE:</b> MAD's are adjusted for maximum elevation on BPA's system and exceed the values listed in in OSHA 1910.269(r) Tables R-7 and R-8. Refer to ANSI Z133.1-2012 and BPA WS-5-1 for additional information.	

59.2. TABLE 8 – Minimum Approach Distance (MAD) from Energized Conductors for All Other Tree Workers.

<b>Table 8: MAD from Energized Conductors for All Other Tree Workers – All Elevations</b>	
<b>Nominal Voltage Phase-to-Phase</b>	<b>MAD (ft-in)</b>
Fiber Optic and Overhead Ground Wires	10'-0"
0 – 50 V	15'-0"
50.1 V – 72.5 kV	15'-0"
72.6 – 121 kV	15'-0"
138 kV	15'-0"
230 kV	16'-5"
287 kV	18'-5"
345 kV	20'-5"
500 kV	26'-8"
<b>NOTE:</b> MAD's are adjusted for maximum elevation on BPA's system, with additions as appropriate, and exceed the values listed in in OSHA 1910.269(r) Tables R-7 and R-8. Refer to ANSI Z133.1-2012 and BPA WS-5-1 for additional information.	

**60. Attachment 1 -- Vegetation Management Job Hazard Analysis Submittal Instructions****Attachment 1****Vegetation Management Job Hazard Analysis Submittal Instructions****Contractors Name:** \_\_\_\_\_**Master Agreement Number:** \_\_\_\_\_

All contractors shall consider the Job Hazards on any projects that they compete for. Once a Contractor has been selected for award, the Contractor's Job Hazard Analysis (JHA) must be submitted for BPA's review, before the Contract or Master Agreement is issued. The list below is not "all inclusive", and contractors are solely responsible for the safety practices of its workers. Please address ALL of the following items in your JHA that apply to the type of projects and the work you will perform.

**1. Compliance with all Federal and State rules and regulations**

Assurance that company will comply with all Federal and State laws and regulations governing the type of work performed on the project

**2. Project Safety Meetings/Daily Safety Briefings**

- a. Job safety briefings at start of project - written documentation required
- b. Daily safety briefings (**written documentation required**) - including proper name and voltage of transmission lines, appropriate Minimum Approach Distances (MAD), and the need for Clearances or Hold Orders. When work commences on a different transmission line, another safety briefing will be conducted that covers all safety related issues including the SPECIFIC transmission line involved in the work, the proper voltage of the transmission line, and the MAD involved
- c. The Contractor shall maintain written documentation of daily job briefings using BPA form 6410.32e or an equivalent format approved by BPA. These reports shall be made available to BPA upon request

**3. Incident/Injury/Near-Miss Reporting**

- a. The Contractor shall maintain an accurate record of, and shall immediately report to the Contracting Officer Technical Representative (COTR) or the onsite BPA Representative in the manner prescribed by the latter, all cases of death, injury, occupational diseases, and near misses arising from, or incident to, performance of work under this contract.
- b. For incidents that involve Personal Injury, Illness, or Property Damage - The Contractor shall complete and file with the BPA Safety Office through the COTR, or onsite BPA Representative, BPA Form 6410.15e (Contractor's Report of Personal Injury, Illness, or Property Damage Accident) within 5 business days of such an occurrence.

- c. For incidents that DO NOT involve Personal Injury, Illness, or Property Damage - The Contractor shall complete and file with the BPA Organization through the COTR, or onsite BPA Representative, BPA Form 6410.18e (Contractor’s Report of Incident/Near-Miss) within five (5) business days of such an occurrence

**4. Use of Personal Protective Equipment**

- a. List types of personal protective equipment appropriate for work being performed
- b. Qualified Line Clearance Tree Trimmers (QLCTT) shall wear red hard hats. All other workers shall wear white hard hats

**5. Use of proper Fall Protection**

List Fall Protection measures appropriate for work being performed

**6. Environmental Issues**

Snake bites, bees, poison oak, heat stress, cold weather

**7. Chainsaw Safety**

List all appropriate safety measures involved with chainsaw work

**8. Minimum Approach Distances (MAD)**

- a. How will Contractor ensure MADs are not violated?
- b. Presence of overhead/nearby transmission lines
- c. Presence of nearby distribution lines
- d. Include Minimum Approach Distance (MAD) tables - Table 7 for Qualified Line Clearance Tree Trimmers (QLCTT), Table 8 for persons other than QLCTT
- e. Use of Safety Watchers for bucket truck work, if necessary
- f. Are Clearances or Hold Orders required?
- g. Use of laser rangefinders capable of determining heights and distances to determine height of trees
- h. Use of controlled felling methods – safety lines, winches, climbing and piecing out
- i. Describe methods used to ensure the safety of workers in the felling zone
- j. Only Qualified Line Clearance Tree Trimmers (QLCTT) can work on trees that have potential to get into Zones A and B

**9. Communication**

- a. State how reliable methods of communication will be maintained between contract workers, Natural Resource Specialists (COTR’s), onsite BPA Representative, and BPA



Transmission Line Maintenance workers. Communicating with COTR's or on-site BPA Representatives is important.

- b. Qualified Line Clearance Tree Trimmers must have fluency in the English language as well as the languages of contractor workers under their supervision
- c. Acknowledge that the Inspector has authority to stop work that presents a safety hazard and the contractor is obligated to comply with that direction

#### **10. Qualification of Workers Used for Falling Danger Trees (QLTCC)**

- a. Assurance that properly qualified workers will be utilized when felling danger trees (Qualified Line Clearance Tree Trimmers - QLCTT)
- b. List the name of the QLCTT's that will be felling trees for your company. Names must be updated and resubmitted to the Contracting Officer if these names change

#### **11. Hazardous Road Conditions**

- a. Steep narrow roads for vehicle and brush machine and navigation
- b. Condition of roads due to weather

#### **12. Equipment Used on Site**

- a. List types of equipment to be used on site
- b. Include use of extender saws or long pole saws

#### **13. Machinery safety**

The Contractor shall ensure that no workers are exposed to injury from the unexpected or accidental startup or release of stored energy of equipment or machinery that is shut down for repair, maintenance or adjustment

#### **14. Herbicide Application**

- a. Maneuvering on access roads, avoiding poles and guy wires
- b. Requirement to have Safety Data Sheets (SDS's) on site
- c. Assurance that Herbicide Applicators have the proper State permits/licenses to perform work with herbicides
- d. Use of respirators if required
- e. Spray shall be directed downward, never up towards transmission line conductors

#### **15. Mowers**

- a. Use of spotter/helpers
- b. Protection of guy wires/wood poles/tower legs
- c. Protection of workers from flying rocks/wood

- d. Protection of nearby vehicles or workers

#### 16. Proper Fueling Procedures

- a. No fueling under power lines
- b. No fuel carried on body

#### 17. Fire safety

- a. Knowledge of fire precaution levels and appropriate rules and regulations when fire precaution levels are raised
- b. Precautions used to prevent fires on rights-of-way
- c. The Contractor is responsible for carrying fire suppression tools

#### 18. Public safety

- a. Explain measures that will be taken to protect the public (property owners, hikers, boaters, etc.)
- b. Traffic control measures that will be taken to protect the public on roadways

#### 19. Handling Downed Conductor

Contractors shall never handle **ungrounded** downed conductors. The handling of downed conductor is to be accomplished **ONLY** by qualified electrical workers using proper techniques. Until the conductor is properly grounded at the location where the work is to be performed and verified by a Qualified Electrical Worker, the Contractor shall not handle the downed conductors.

#### 20. Electrical Contact Protocol

Any worker experiencing an electrical shock of any type shall be transported to the nearest emergency medical facility as soon as possible.

In case of electrical shock, the worker is advised to contact one of the Electrical Burn Centers that specialize in electrical shock accidents.

There are three Electrical Burn Centers serving BPA's service territory.

**Emanuel (Portland)** covers all of Oregon and north to the Kelso/Longview, Washington area. **Harborview (Seattle)** covers the rest of Washington and into northern Idaho and western Montana. **Intermountain (Salt Lake City)** covers southern Idaho. The operative standard is to have a maximum of three hours (air travel) time to the nearest burn unit. All three work co-operatively.

**Legacy Emanuel Medical Center (Portland, Oregon)** [1-888-598-4232](tel:1-888-598-4232)

**Harborview Medical Center (Seattle, Washington)** [1-888-731-4791](tel:1-888-731-4791)

Intermountain Burn Center - University of UT (Salt Lake City, Utah) [1-801-581-2700](tel:1-801-581-2700)

**61. Large Scale Logging Operations:** For large scale logging operations, such as clear-cutting timber associated with a BPA land sale, or clearing timber for a new/replacement transmission line, the Contractor shall submit a Site Specific Safety Plan (SSSP) to the BPA Safety Organization for review and comment.  
**Appendix 1 – Minimum Approach Distance (MAD) Tables**

**62. TABLE 1 – Minimum Approach Distances (MAD) For Non-Qualified Workers**

<b>Table 1 MAD for Non-Qualified Workers – All Elevations</b>	
<b>Nominal System Voltage</b>	<b>Phase-Ground (ft-in)</b>
Up to 345 kV	15'-0"
Above 345 kV	20'-0"
Energized ground wire – (Airway lighting & PCS up to 14.4 kV)	15'-0"
Insulated Overhead Ground Wire	10'-0"
Fiber Optic Ground Wire (OPGW)	10'-0"

**TABLE 2 – Minimum Approach Distance (MAD) for Vehicles and Equipment**

<b>Table 2 MAD for Vehicles and Equipment – All Elevations</b>	
<b>Nominal Voltage Phase-to-Phase</b>	<b>MAD (ft-in) Phase-to-Ground</b>
Up to 345 kV	15'-0"
500 kV AC	20'-0"
ALL DC Facilities	20'-0"

**TABLE 3 – Minimum Approach Distances (MAD) For Transporting Equipment Under Energized Transmission Lines**

<b>Table 3 MAD for Transporting Equipment Under Energized Transmission Lines</b>	
<b>Nominal Voltage Phase-to-Phase</b>	<b>MAD* Phase-to-Ground</b>
50 kV or Less	4 feet
50 kV to 345 kV	10 feet
500 kV	16 feet
*Note: The minimum approach distances listed in Table 3 are reduced from those required in Table 2 due to the subtraction of the inadvertent movement factor. They may be used only when complying with the required conditions listed for the use of Table 3.	

**63. TABLE 4 – Minimum Approach Distances (MAD) for Qualified Electrical Workers**

<b>Table 4 AC MAD for Qualified Workers</b>			
<b>AC MAD for Elevations ≤ 3000'</b>			
<b>Nominal System Voltage Phase to Phase</b>	<b>Phase-Ground MAD (3)</b>		<b>Phase-Phase MAD (3)</b>
	<b>MAD Without Hold Order &amp; NO Tools</b>	<b>MAD With Hold Order for Tools</b>	<b>MAD With Hold Order for Tools</b>
301-750 V (1)	1'-1"	1'-1"	(2)
751 V - 5 kV	2'-1"	2'-1"	(2)
15 kV	2'-2"	2'-2"	(2)
34.5 kV	2'-7"	2'-7"	(2)
69 kV	3'-4"	3'-4"	(2)
115 kV	3'-6" *	3'-2"	4'-1"
138 kV	4'-0" *	3'-4"	4'-6"
161 kV	3'-8" *	3'-8"	5'-0"
230 kV	6'-2" *	4'-5"	6'-8"
287 kV	5'-2" *	4'-11"	7'-9"
345 kV	5'-11" *	5'-9"	9'-10"
500 kV (100" Design)	9'-10" *	7'-6"	14'-6"
500 kV (All Others) (5)	8'-8" *	7'-6"	14'-6"
500 kV Series Caps (4,5)	11'-3" *	11'-11"	24'-1"

<b>Table 4 AC MAD for Qualified Workers</b>			
<b>AC MAD for Elevations 3001' to 6000'</b>			
301-750 V (1)	1'-1"	1'-1"	(2)
751 V - 5 kV	2'-1"	2'-1"	(4)
15 kV	2'-4"	2'-4"	(4)
34.5 kV	2'-9"	2'-9"	(4)
69 kV	3'-7"	3'-7"	(4)
115 kV	3'-9" *	3'-3"	4'-4"
138 kV	4'-3" *	3'-5"	4'-9"
161 kV	3'-10" *	3'-10"	5'-4"
230 kV	6'-7" *	4'-9"	7'-1"
287 kV	5'-4" *	5'-3"	8'-3"
345 kV	6'-4" *	6'-0"	10'-6"
500 kV (100" Design)	10'-6" *	8'-0"	15'-7"
500 kV (All Others) (5)	9'-3" *	8'-0"	15'-7"
500 kV Series Caps (4,5)	12'-0" *	12'-9"	25'-11"

<b>Table 4 AC MAD for Qualified Workers</b>			
<b>AC MAD for Elevations 6001' to 9000'</b>			
301-750 V (1)	1'-1"	1'-1"	(2)
751 V - 5 kV	2'-1"	2'-1"	(4)
15 kV	2'-6"	2'-6"	(4)
34.5 kV	2'-11"	2'-11"	(4)
69 kV	3'-9"	3'-9"	(4)
115 kV	3'-11" *	3'-5"	4'-8"
138 kV	4'-5" *	3'-8"	6'-6"
161 kV	4'-0" *	4'-0"	5'-7"
230 kV	6'-11" *	4'-11"	7'-5"
287 kV	5'-7" *	5'-5"	8'-8"
345 kV	6'-8" *	6'-4"	11'-1"
500 kV (100" Design)	11'-0" *	8'-5"	16'-5"
500 kV (All Others) (5)	9'-9" *	8'-5"	16'-5"
500 kV Series Caps (4,5)	12'-8" *	13'-5"	27'-4"

**64. TABLE 5 – Minimum Approach Distances (MAD) for Qualified Electrical Workers**

<b>Table 5 MAD for Overhead Ground Wires – All Elevations</b>		
	<u>MAD Without Hold Order (ft-in)</u>	<u>MAD With Hold Order (ft-in)</u>
Insulated Overhead Ground Wire	2'-0"	2'-0"
Fiber Optic (OPGW)	2'-0"	2'-0"
Energized Ground Wire (Airway lighting & PCS up to 14.4 kV)	2'-6"	2'-6"

**65. TABLE 6 – Minimum Approach Distances (MAD) for Qualified Electrical Workers**

<b>Table 6 DC MAD for Elevations ≤ 7000'</b>		
<b>Nominal System Voltage</b>	<b>Pole -- Ground</b>	<b>Pole – Pole</b>
	<u>MAD for Tools Restart Blocked &amp; Disabled (ft-in)</u>	<u>MAD for Tools Restart Blocked &amp; Disabled (ft-in)</u>
69 kV	3'-4"	N/A
400 kV	7'-8"	12'-0"
448 kV	8'-10"	13'-3"
500 kV	10'-3"	14'-8"
520 kV	10'-9"	15'-2"
560 kV	11'-11"	16'-4"

**66. TABLE 7 – Minimum Approach Distance (MAD) from Energized Conductors for Qualified Line Clearance Tree Trimmers**

<b>Table 7 - MAD from Energized Conductors for Qualified Line Clearance Tree Trimmers – All Elevations</b>	
<b>Nominal Voltage (Phase-to-Phase)</b>	<b><u>MAD without Hold Order (ft-in)</u></b>
51 – 300 V	Avoid Contact
750 V	2'-1"
15 kV	2'-9"
34.5 kV	3'-5"
46 kV	3'-10"
69 kV	4'-9"
115 kV	5'-2"
138 kV	5'-11"
161 kV	6'-10"
230 kV	9'-0"
287 kV	11'-3"
345 kV	15'-0"
500 kV	21'-9"

**NOTE:** MAD's are adjusted for maximum elevation on BPA's system and exceed the values listed in OSHA 1910.269(r) Tables R-7 and R-8. Refer to ANSI Z133.1-2012 and BPA WS-5-1 for additional information.

**67. TABLE 8 – Minimum Approach Distance (MAD) from Energized Conductors for All Other Tree Workers**

<b>Table 8 MAD from Energized Conductors for All Other Tree Workers – All Elevations</b>	
<b>Nominal Voltage Phase-to-Phase</b>	<b>MAD (ft-in)</b>
Fiber Optic and Overhead Ground Wires	10'-0"
0 – 50 V	15'-0"
50.1 V – 72.5 kV	15'-0"
72.6 – 121 kV	15'-0"
138 kV	15'-0"
230 kV	16'-5"
287 kV	18'-5"
345 kV	20'-5"
500 kV	26'-8"

**NOTE:** MAD's are adjusted for maximum elevation on BPA's system, with additions as appropriate, and exceed the values listed in in OSHA 1910.269(r) Tables R-7 and R-8. Refer to ANSI Z133.1-2012 and BPA WS-5-1 for additional information.