

BONNEVILLE POWER ADMINISTRATION

Contractor Safety and Health Requirements for Prime and Subcontractors

Effective Date: October 1, 2020

Version: 21-2



TABLE OF CONTENTS

CHAPTER 1 – GENERAL REQUIREMENTS – APPLICABLE TO ALL BPA PROJECTS	1
1. General:.....	1
2. Safety Plan	2
3. Waiver Process	4
4. Blasting.....	4
5. Emergency Communications	4
6. Emergency Action Plan	5
7. Permit Required Confined Spaces.....	5
8. Access to Energized Facilities and Communications Sites:	5
9. Identification of Circuits	6
10. Utility Locates.....	6
11. Voltage Testing	6
12. Arc Flash Hazards.....	7
13. Barriers and Guards.....	8
14. Capacitors	8
15. Conductive Devices	8
16. Barriers and Guards - Electrical.....	9
17. Barriers and Guards – Non-Electrical	9
18. Electrical Contact Protocol	10
19. Grounding Grid.....	10
20. Grounding.....	12
21. Grounds, Portable Protective, Static Wire	13
22. Grounding of Power/Lift Equipment	13
23. Extension Cords, Tools, and Metallic Cables	14
24. Lightning Work Curtailment:.....	14
25. Minimum Approach Distance (MAD):.....	14
26. Safety Watcher	21
27. Environmental Hazards:.....	22
28. Equipment and Rigging:.....	22
29. Spill Kits:.....	23
30. Fall Protection:	24
31. Fiber Optics:	24
32. Fire Hazards:.....	25
33. Hazard Communication:.....	25
34. Job Briefing:	26
35. Lockout/Tagout (LOTO) – Control of Hazardous Energy:	26
36. Medical Services and First Aid:.....	27
37. Personal Protective Equipment (PPE):.....	27
38. Radio Frequency Exposure, for Personal Communication Systems:.....	28
39. Toilet Facilities:.....	29
40. Traffic Control:.....	29
41. Trenching and Excavation:.....	29
42. Welding:	29
43. Work Permits:.....	30

CHAPTER 2 – WORK IN SUBSTATIONS AND RELATED BPA FACILITIES	32
1. Minimum Qualifications for Qualified Electrical Workers (QEWs):	32
2. Coupling Capacitors and Bushing Potential Devices:	32
3. Current Transformer (CT) Secondary:	32
4. Requirements for Work on Normally Energized Lines and Equipment that are Separated by an Isolating Device Under the Provisions of a Work Clearance:	33
5. Ground Grid – Substations:	34
6. Switches, Isolating Devices, Energized, Restrictions On:	34
CHAPTER 3 – WORK ON BPA RIGHT-OF-WAYS AND TOWERS	35
1. Minimum Qualifications for Qualified Electrical Line Workers:	35
2. Minimum Crew Size:	35
3. Requirements for Work on Lines Physically Separated from the BPA System, Including New Construction and Return to Construction Status:	36
4. Requirements for Work on Normally Energized Lines and Equipment that are Separated by an Isolating Device Under the Provisions of a Work Clearance:	37
5. Hand Lines and Rope Used in Energized Corridors:	39
6. Proximity of Equipment, Machinery, and Vehicles to Transmission Line Structures:	39
7. Counterpoise:	39
8. Stringing or Removing Conductor:	40
CHAPTER 4 – COMMERCIAL AVIATION SERVICES (NON- TRANSPORTATION).....	41
1. Commercial Aviation Services (CAS) General -- Applicable to ALL CAS Operations:	41
2. Airplane Services (Non-Transportation):	43
3. Helicopter Services – (Non-Transportation) General Requirements:	45
4. Helicopter Services – Aerial Survey Operations (Non-Electrical Contractors) (14 CFR Part 91):	46
5. Helicopter Services – Construction/Repair External Load Work (14 CFR Part 133):	47
6. Helicopter Services - Heli-Saw Operations	49
7. Small Unmanned Aircraft Systems (sUAS):	51
CHAPTER 5 – VEGETATION MANAGEMENT	52
1. Daily Job Briefings:	52
2. Minimum Qualifications for Contractor Workers:	52
4. Tree Falling:	53
5. Flammable Liquids:	54
6. Communications:	54
7. Minimum Approach Distance (MAD):	54
ATTACHMENT 1 – Vegetation Management Job Hazard Analysis Submittal Instructions	55

CHAPTER 1 – GENERAL REQUIREMENTS – APPLICABLE TO ALL BPA PROJECTS

This document applies to contracts containing Bonneville Purchasing Instruction (BPI), Clause 15-12, Contractor Safety and Health and Clause 15-13, Contractor Safety and Health Requirements. Chapter 1, General Requirements, applies to ALL work. Chapters 2 through 5 are specific to the types of work required by the following documents:

- Statement of Work
- Construction Specification

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

1. General:

- 1.1 The Contractor will furnish to each employee a workplace that is free from recognized hazards that are causing or likely to cause death or serious physical harm. The Contractor will comply with the regulations promulgated under the Occupational Safety and Health Act (OSHA) of 1970. Each Contractor and Subcontractor employee will comply with all Federal and State safety and health regulations, standards, and requirements. In fulfilling these requirements, the Contractor will 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 29 CFR Part 1910, Occupational Safety and Health Standards for General Industry or equivalent OSHA State plan standards.
 - 1.1.3 29 CFR Part 1926, Occupational Safety and Health Standards 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 will prevail.
- 1.2 Notification of Imminent Danger and Workers Right to Decline Work
 - 1.2.1 All workers, including Contractors, and BPA workers, 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 likelihood 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.
 - 1.2.2 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. BPI Contract 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.

1.3 Incident Reporting/Investigations.

- 1.3.1 All incidents related to; contract-related work, operations, or facility for which this manual is applicable will be reported, investigated and analyzed.
- 1.3.2 Contractor employees are responsible for reporting all incidents immediately to their Employer or Supervisor.
- 1.3.4 Contractor are responsible for reporting all incidents to the Contracting Officer (CO), Contracting Officer's Representative (COR) and BPA Safety Organization within 24 hours. No Contractor may decline to accept a report of an incident from a subordinate.
 - 1.3.4.1 For all OSHA recordable incidents the Contractor will complete and file with the CO and COR, BPA Form 6410.15e, Contractor's Report of Personal Injury, Illness or Property Damage Accident within 24 hours of such an occurrence. The Contractor will submit applicable photographs and witness statements.
 - 1.3.4.2 For all Non-OSHA recordable incidents, the Contractor will complete and file with the CO and COR, BPA Form 6410.18e, Contractor's Report of Incident/Near Miss within 5 calendar days of such an occurrence. The Contractor will submit applicable photographs and witness statements.
- 1.3.5 Any incident that has, or appears to have, any of the consequences listed below in subparagraph 1.3.6 will be reported within 1-hour of occurrence to the CO and COR. The report will then be assigned to a BPA Safety Manager for further action.
- 1.3.6 These accidents will be investigated in depth by both the Contractor and BPA to identify all causes and to recommend hazard control measures. The COR will immediately notify the BPA Safety Organization when any of these occurs and subsequently follow-up with official accident investigation report. The accident investigation report will be due to the COR within 45 calendar days from the date of the accident.
 - 1.3.6.1 Fatal injury/illness;
 - 1.3.6.2 Permanent totally disabling injury/illness;
 - 1.3.6.3 Permanent partial disabling injury/illness;
 - 1.3.6.4 One (1) or more persons hospitalized as inpatients as a result of a single occurrence;
 - 1.3.6.5 Three (3) or more individuals become ill or have a medical condition that is suspected to be related to a site condition, or a hazardous or toxic agent on the site;
 - 1.3.6.6 BPA or Contractor aircraft destroyed or missing;
 - 1.3.6.7 Contractors are responsible for notifying OSHA in accordance with 29 CFR 1904.39 within 8-hours when their employee(s) is fatally injured or 1 or more persons are hospitalized as inpatients as a result of a single occurrence.
- 1.3.7 Any incident that meets the requirements of 1.3.6 above, the Contractor will perform the following actions to support the BPA's accident investigation team:
 - 1.3.7.1 All workers will immediately stand-down and stop work at the site.

- 1.3.7.2 The Contractor will secure the site, from any changes until released, in writing, by the CO in consultation with the BPA Safety Organization.
- 1.3.7.3 Ensure all witness statements are gathered and provided to the BPA investigation team upon arrival to the site.
- 1.3.7.4 The Contractor and their workers, and subcontractors, will cooperate fully with the BPA accident investigation team.
- 1.3.7.5 Provide all worker training logs and records, within 24 hours of request.
- 1.3.7.6 Provide a summary of any medical injuries, and any additional information on the workers' physical capabilities/readiness level to perform work.

2. Safety Plans:

- 2.1 Prepare, implement and enforce a written Safety Plan (SP) for each contract or task order utilizing BPA's Safety Plan Template. The SP will address all employee work process hazards, and controls.
- 2.2 Abbreviated Safety Plans may be prepared for contracts with low risk activities that meet the following criteria:
 - 2.2.1 Contractors entering energized facilities solely for observation activities. Examples, project management, design scoping (observation only), engineering studies (observation only)
 - 2.2.2 Work requires no advanced or specialized personal protective equipment (PPE) beyond hard hat, safety boots, safety glasses and reflective vest (examples of advanced or specialized PPE: personal fall arrest/restraint system, respirator, rubber gloves, ear plugs/hearing protection, Flame Resistant (FR) clothing, etc.), lead worker training, lead awareness, asbestos awareness, or asbestos worker training.
 - 2.2.3 Work requires no specialized training, formal training, licensing, certification or qualification (examples of specialized training and licensing: HVAC, Industrial Lift Truck, Permit Required Confined Space Training, Fall Protection Training, Crane Operator certification, pest control applicators license, etc.).
 - 2.2.4 Work does not directly expose contractor employee(s) to the hazards associated with other work (examples: suspended load, aggregate haulers where delivery of materials requires material handling or site hazard exposure, heavy equipment is in operation, traffic control flaggers).
- 2.3 The CO will notify the Contractor if the Abbreviated SP is authorized.
- 2.4 Copy of the Contractor's written SP is to be submitted at least 10 business days prior to the start of on-site work. If the BPA Safety Organization determines the SP to be insufficient, they may stop the contractor's right to start any or all of the on-site work.
 - 2.4.1 If the BPA requests that the SP be revised and resubmitted following review, the revised portions will be highlighted when resubmitted. The BPA will have 3 business days to review and respond to the Contractor's revisions to the SP.
- 2.5 The Contractor will make the SP available to all workers at the work site. All workers must be familiar with its content. The SP will be available for review by BPA employees upon request.

- 2.6 The Contractor will ensure that their subcontractors, suppliers, and support personnel follow all safety and health requirements and that all personnel working on the project are knowledgeable of the content in the SP.
- 2.7 The Contractor will continuously monitor applicability and update the SP when conditions change.
- 2.8 Large Scale Logging Operations.
 - 2.8.1 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 will submit a SP to the BPA Safety Organization for review and comment.

3. Waiver Process:

- 3.1 Waivers to the contract require the approval of the Chief Safety Officer (CSO) and the Deputy Director, Construction and Contract Safety. Waivers will provide an equal or greater level of protection and be substantiated with a job hazard analysis of the activity.
- 3.2 Official requests for waivers and all responses will be in writing.
- 3.3 Waiver requests will be complete and include the following:
 - 3.3.1 Identification of the current requirement for which relief is being sought, including exact quotation of the contract/regulatory language;
 - 3.3.2 Statement as to whether a waiver (total elimination of the requirement) is being sought;
 - 3.3.3 Details outlining why is not possible or practical to comply with the current requirements;
 - 3.3.4 Documentation including; maps, drawings, references, calculations, change analysis, or impacts necessary to make an informed decision. The burden of proof rests with the requesting organization. Failure to provide the requisite information will be justification for denial of the request. It is incumbent on the requestor to make the case as to why the existing requirement should be waived;
 - 3.3.5 Identification of specific time period and operation for which the request is being made. A waiver will be granted for a specific time period and operations and may not be used as a defense for failure to comply with the requirements at another time or on another project. Waivers are considered on a case-by-case basis;
 - 3.3.6 Explanation of methodology to be used in lieu of the current requirement and how the waiver provides equal to or greater protection than the stated requirement;
 - 3.3.7 A detailed Job Hazard Analysis (JHA) addressing the alternate procedure. Risk assessments will be considered as a part of the JHA process;
 - 3.3.8 Provision of any and all other standards addressing the requirement in question. It is incumbent on the requester to research the literature to determine if any other requirement or standard exists addressing the requirement from which relief is being requested. If there is another standard(s), the requestor must identify it and provide a copy. Requests for waiver will not be processed until this requirement is met;

- 3.3.9 Waivers will remain in force for the life of the contract and be maintained with the NF Safety Office. Waivers serve as a repository and a source of information for design review on any/all future contracts.
- 3.4 The requestor will work the waiver action with the assigned Safety and Occupational Health Manager and the respective COR. The requestor will provide an official signed memorandum requesting consideration. These documents will be sent via mail in hard copy or via e-mail with attached documentation in Portable Document Format (pdf) to the Deputy Director, Construction and Contract Safety Manager, Construction Safety, with a copy furnished to the Chief Safety Officer.
- 3.5 The Director of Construction Safety and the assigned Safety Manager will evaluate the request and will have a minimum of 10 business days from the date of receipt to consider the request and to render a written decision.
- 3.6 A waiver will not be carried over to other operations unless the evaluators extend the scope to include other times and activities. If warranted, the Construction Safety Manager may issue an organizational waiver based on an individual request, however an organizational waiver normally indicates a flawed requirement and hence, the actual requirement may be in need of correction/change.

4. Blasting:

- 4.1 Adequate geotechnical investigations will precede all blasting operations to determine characteristics of the materials to be blasted.
- 4.2 All blasting must comply with the requirements in project construction specification, Section 31 23 16.29 - Blasting.

5. Emergency Communications:

- 5.1 The Contractor will ensure that field supervision maintains a reliable method of emergency communications in the event of accident or illness. The Contractor will conduct communication checks/tests to ensure quality of communications with emergency personnel and BPA representative(s) onsite.
- 5.2 Employees will be provided with an effective means of emergency communications (i.e., cellular phone, two-way radios, or other acceptable means).
- 5.3 The selected method of communication will be readily available (within immediate reach) of the employee(s) and will be tested prior to the start of work to verify effective operation, specifically as it relates to remote work areas.
- 5.4 An employee check-in/check-out communication procedure will be developed to ensure employee safety.

6. Emergency Action Plan:

- 6.1 The Contractor will assess, develop, and prepare an Emergency Action Plan. The plan will be in writing, kept at the workplace, and available to employees for their review. Note: An employer with 10 or fewer employees may communicate the plan orally to employees.

- 6.2 The Contractor will identify procedures for reporting a fire or other emergency, locate and provide directions to the nearest emergency medical facilities, identification of evacuation routes, assembly areas, and a procedure for accounting for all employees. This will include phone numbers for emergency services in the area.
- 6.3 Many BPA facilities have an Occupant Emergency Plan (OEP). Each occupant, including Contractors and subcontractor(s) must be aware of and familiar with the OEP. OEPs may be obtained from the CO or BPA District Manager prior to the start of work.

7. Permit Required Confined Spaces:

- 7.1 The Contractor will identify any required worker entry into a Permit Required Confined Space (PRCS) / Confined Space (CS) as defined by Federal OSHA Standards, 1910.146 (General Industry) or 1926.1200 (Construction) and applicable State requirements or Industry standards.
- 7.2 The Contractor will evaluate and identify any PRCS/CS entry and demonstrate, through the preparation of the employer's written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry. The Contractor will review and post all entry permits at the point of entry into the space.
- 7.3 The Contractor will test for hazards before, and during, any worker entry into an identified PRCS and confined space.
- 7.4 The employer will retain each canceled entry permit for at least one year to facilitate the review of the permit-required confined space program required of this section. Any problems encountered during an entry operation will be noted on the pertinent permit so that appropriate revisions to the PRCS program can be made.
- 7.5 The employer will provide training so that all employees whose work is regulated by this section acquire the understanding, knowledge, and skills necessary for the safe performance of the duties assigned under this section.
- 7.6 The employer is required to evaluate and address rescue service's ability, in terms of proficiency with rescue-related tasks and equipment, to function appropriately while rescuing entrants from the particular permit space or types of permit spaces identified. To facilitate non-entry rescue, retrieval systems or methods will be used whenever an authorized entrant enters a permit space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. Retrieval systems will meet applicable regulations and standards.

8. Access to Energized Facilities and Communications Sites:

- 8.1 Rules and requirements governing the issuance of Permits for unescorted energized access, movement within, and exit from energized facilities and communication sites are defined in BPA's *Rules of Conduct Handbook (ROCH)*. Contractors will comply with these requirements.
- 8.2 All Contractor workers must obtain a Non-Electrical Worker, Restricted Electrical Worker, or Electrical Worker permit, as applicable for unescorted entry to BPA energized facilities and communication sites. Un-permitted workers will be escorted at all times as indicated in the ROCH.

- 8.3 Whenever a worker enters energized facilities and communication sites, or whenever work is otherwise in proximity to BPA's normally-energized transmission facilities, the Contractor will provide for the safety of the workers and will at all times take necessary precautions to protect workers from accidental contact. At no time will any non-permitted worker or equipment come closer to energized lines or equipment than the Minimum Approach Distance (MAD) in Section 25.
- 8.4 Entry into, exit out of, and movement within an energized facility or communication site by a non-permitted person requires an escort. Escorts must hold a permit that would allow them to perform the work by the person being escorted. *See ROCH section 8.4, Escorting.*
- 8.5 No more than 5 unpermitted visitors are allowed for a single escort (5:1 ratio) at energized facilities with a North American Electric Reliability Corporation (NERC), Critical Infrastructure Protection (CIP) Physical Security Perimeter (PSP) and at Control Centers. The Contractor will discuss the specific use of escorts as a part of the SP.

9. Identification of Circuits:

- 9.1 No work will be performed on any circuit until a Qualified Electrical Worker who holds an electrical work permit has established positive identification of all electrical circuits in the work area. Before work begins, a Qualified Electrical Employee/Person in charge will ascertain by inquiry, direct observation and by instruments, whether any part of an electric power circuit (exposed or concealed) is located such that the performance of work could bring any person, tool, or machine into physical or electrical contact with it. This verification procedure will be documented prior to work beginning.

Note: The term Qualified Electrical Employee/Person is understood to mean; "Qualified Electrical Employee" is a Qualified Electrical BPA employee and "Qualified Electrical Worker" is a Contractor, non-BPA employee. These definitions provide consistency throughout this document and align with the terminology in the BPA Accident Prevention Manual (APM).

10. Utility Locates:

- 10.1 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:
 - 10.1.1 Underground utilities of all types;
 - 10.1.2 Substation grounding grids (around the perimeter of and underneath substations);
 - 10.1.3 Telecommunication tower grounding rings (buried beneath the towers);
 - 10.1.4 Counterpoise (smaller ground mats located at the base of electrical transmission towers);
 - 10.1.5 Utilities inside and below BPA facilities. This includes utilities concealed in floors, walls, ceilings, and crawl spaces.

11. Voltage Testing:

- 11.1 The Contractor will ensure that, unless a previously installed ground is present, employees test lines and equipment and verify the absence of nominal voltage before employees install any ground on those lines or that equipment.
- 11.2 If there is any indication that the circuit being tested is still energized at full line potential, the employee will:
 - 11.2.1 Not apply Portable Protective Grounds;
 - 11.2.2 Maintain Minimum Approach Distance;
 - 11.2.3 Recheck circuit identification;
 - 11.2.4 Notify dispatcher.
- 11.3 The BPA Work Standard BPA-WS-6-2, *Voltage Testing Procedures*, will be made available upon request.
- 11.4 Attachment points of portable protective grounds and bonding jumpers will be made conductive by removing any paint or corrosion before attachments are made.
- 11.5 When Personal Protective Grounds (PPGs) are required, they will be installed as close to the work being performed as practical and properly secured in such a manner as not to be disturbed during the course of the work or come in contact with personnel.
- 11.6 No disconnect switch, power circuit breaker, transformer, wave trap, fuse, or current limiting reactor will be part of the protective grounding circuit.

Note: Does not apply to a visible single-turn primary such as in a “donut” CT circuit.

11.7 Minimum Crew Size (PPGs):

- 11.7.1 The minimum crew for installing PPGs will consist of 2 Qualified Electrical Workers, or 1 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.
- 11.7.2 The minimum crew for removing PPGs will consist of 1 Qualified Electrical Worker and 1 other worker.

11.8 Installing and Removing PPGs:

- 11.8.1 All PPGs will be installed and removed with approved live-line tools.
- 11.8.2 When attaching PPGs, the ground end will be attached first then the conductor end from that same ground set will be connected to de-energized electrical parts.
- 11.8.3 Workers should avoid handling or contacting the PPGs while the conductor end is installed or removed.
- 11.8.4 During removal, all ground leads of each PPG set will be disconnected from the conductor end first. The conductor ends from that same set will 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.

- 11.8.5 In some cases it may be difficult to remove a PPG with a live line tool (such as one installed during construction). In these cases, a second PPG 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.
- 11.9 When working under a Clearance, the Clearance Holder will identify all parts of the protective grounding circuit prior to the installation of PPGs to ensure that a thorough understanding of the specific grounding circuit exists by all crew members prior to the start of work.

12. Arc Flash Hazards:

- 12.1 For entry into energized facilities or communication sites, all Contractors will wear arc-rated clothing (long-sleeved shirts and pants or coveralls) with a minimum rating of 8 cal/cm². Boots are required to have all leather uppers to meet the 8 cal/cm² rating. This requirement for boots is in addition to the requirements listed in 37.5 and 37.6 of Section 37 on page 28. Additional PPE may be required based on the hazard(s).

Exemption: The Contractor may request an exemption from requiring non-permitted persons to wear arc flash rated clothing during short-term duration work activities. Examples would be the delivery/removal of material or completing maintenance tasks on sanitary facilities. The work activities must be specified in detail in the Safety Plan with the Contractor ensuring that the activities by non-permitted persons will not result in an exposure to an arc event at or above 1.2 cal/cm². This must be followed in order to be granted an exemption.

Arc rated clothing will be required when unanticipated work activities require the contractor to bring in other non-permitted visitors to the work site. Unanticipated work activities would be all other work that does not fall under the short-term duration work activities described in the paragraph above. The Contractor will furnish their visitors with coveralls that have an 8 cal/cm² rating.

- 12.2 Arc flash personal protective clothing and equipment appropriate for the hazard/risk category will be utilized in accordance with OSHA 1910.269; NFPA 70E and/or BPA provided arc flash studies. At a minimum, the Contractor will address:

- 12.2.1 Incident energy analysis, or

- 12.2.2 AF PPE hazard category.

- 12.3 Electrical work (greater than 50 volts to 600 volts) will be performed in an electrically safe work condition. The Contractor may request an exemption from this requirement by completing a Contractor Energized Electrical Work Permit (CEEWP).

Note: Electrically Safe Work Condition - A state in which an electrical conductor or circuit part has been protected by the use of dielectric barriers to prevent contact by persons or conductive objects OR has been disconnected from energized parts, locked/tagged in accordance with established standards, tested to ensure the absence of voltage and grounded/bonded if determined necessary.

- 12.4 The Contractor will use the BPA form F 6410.42e, *Contract Energized Electrical Work Permit*, following instructions attached to the form. The exemption will not be considered complete until reviewed and signed in accordance with the form requirements.

- 12.5 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.

- 12.6 If, during the course of the work, an unlabeled panel is discovered, the Contractor will:

- 12.6.1 Immediately stop work;

- 12.6.2 Notify the COR for consultation with a BPA Qualified Electrical Employee and/or BPA Engineering;
 - 12.6.3 Proceed only after the calorie rating has been clearly identified and if applicable, the CEEWP has been updated;
 - 12.6.4 If the incident energy (analysis) cannot be determined the panel(s) that are not labeled will be worked in an electrically safe work condition.
- 12.7 Clearly mark the Limited Approach Boundary (LAB) to protect unqualified/non-permitted persons who may be in the vicinity of work that involves a shock or arc flash hazard. Install necessary barriers or guards in the work in accordance with Section 16, Barriers and Guards - Electrical.

13. Batteries and Chargers:

- 13.1 All battery work will be performed in accordance with the manufacturer instructions, and applicable Federal / State regulations. The BPA Work Standard BPA-WS-9-2, *Batteries & Chargers*, will be made available upon request.
- 13.2 The Contractor will ensure sufficient ventilation of gases from storage batteries to prevent the accumulation of explosive mixtures. Contractors are responsible for the atmospheric monitoring of the workspace to ensure hazardous atmospheres do not exist.
- 13.3 For safe battery handling operations, the following PPE will be made available:
 - 13.3.1 Goggles and face shields appropriate to the chemical and electrical hazard;
 - 13.3.2 Acid-resistant rubber gloves;
 - 13.3.3 Protective rubber aprons and safety shoes; and
 - 13.3.4 Lifting devices of adequate capacity, when required.

14. Capacitors:

- 14.1 Do not depend on the internal resistor of a capacitor cell to discharge capacitors. Before handling, use a bayonet-type short-circuiting and grounding rod applied between all insulated terminals and the capacitor case for at least 5 seconds. Short all cells being removed, stored or transported, with at least a No. 18 wire, between all insulated terminals and the capacitor case.

15. Conductive Devices:

- 15.1 Portable metal ladders are not permitted in energized facilities or communication sites or for use in any situation where there is danger of contact with energized lines or equipment.
- 15.2 Conductive objects such as metal tapes, surveyor chains, fish tapes, and center lines 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.

16. Barriers and Guards – Electrical:

- 16.1 Barriers and guards will be used where necessary to protect workers from electrical hazards that might exist. Such barriers and guards will meet the requirements of ANSI Z535, *Safety Standard Signs*.

Note: A barrier is a device that prevents electrical contact with energized parts while working within the MAD. A guard is a device used to maintain minimum approach distances, which include the margin for inadvertent movement. Example – Items such as fences and enclosures.

- 16.2 The Contractor may be required to erect, maintain, and/or remove guards, such as safety fences to prevent accidental contact between BPA's normally energized facilities and the Contractor's equipment or workers. Comparison will be made between the Minimum Approach Distance (MAD) listed in Table A, Table B, and Table C in Section 25, and the arc flash boundary. Guards will be placed no closer than the greater of these two distances to ensure protection from shock and arc flash hazards. BPA will normally furnish the safety fences required in its energized facilities or communication equipment sites. The safety fences will not be removed without consent. Safety fences furnished by BPA remain the property of BPA.
- 16.3 Barrier: These non-conductive devices will be installed and removed with hot line tools or under the protection of a Clearance with all conducting parts shorted and bonded together to a common ground. Approved insulated barriers will be inspected before each use.
- 16.4 Attendants: If signs and barriers do not provide sufficient warning and protection from electrical hazards, an attendant will be stationed to warn and protect workers. The primary duty and responsibility of an attendant providing manual signaling and alerting will be to keep unqualified person(s) outside a work area where the unqualified person might be exposed to electrical hazards. An attendant will remain in the area as long as there is a potential for workers to be exposed to the electrical hazards.
- 16.5 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 will 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.
- 16.6 Areas guarded with red-and-white rope will not be entered. This guard is used on the ground and in structures to prohibit all persons from entering the energized zone. Only a BPA Qualified Electrical Employee may remove red-and-white rope.
- 16.7 Areas guarded with yellow-and-black rope may be entered by holders of an Electrical Worker Permit. Entry by others is prohibited unless accompanied by a holder of an Electrical Worker Permit. Yellow-and-black rope guards will be installed under the supervision of a BPA Qualified Electrical Employee. This guard may be removed by others upon approval of the responsible BPA Qualified Electrical Employee.
- 16.8 Red-and-white and yellow-and-black rope will not be used for any purpose except electrical guards. No other rope color will be used for electrical guards. The BPA Safety Organization must approve special-purpose electrical barriers and guards.

17. Barriers and Guards – Non Electrical:

- 17.1 Barriers and guards, known to be adequate for other circumstances, must also be utilized in protecting against mechanical, environmental, and other nonelectrical hazards such as open excavations or manholes. Environmentally contaminated areas will be guarded and identified by signs and may be entered only by persons who have been trained to protect themselves from the hazards of the contaminants present.

18. Electrical Contact Protocol:

- 18.1 Any worker experiencing an electrical shock of any type will be transported to the nearest emergency medical facility as soon as possible.
- 18.2 Electrical Contact is defined as any current flow through or across the employee's body or if any of the following is true.
 - 18.2.1 Burns or wounds;
 - 18.2.2 Interrupted or impaired breathing;
 - 18.2.3 The employee not able to let go of a circuit or equipment;
 - 18.2.4 Any neurological problems, including but not limited to tremors, shaking, numbness, difficulty balancing, difficulty walking, confusion, disorientation, speech difficulties, vision problems, or bladder problems, or headache;
 - 18.2.5 Pain lasting greater than 5 minutes.
- 18.3 Following any electrical contact injury immediately call 911, Emergency Medical Services (EMS) and initiate First Aid. Do not transport the injured employee, unless the accident occurred in a remote location.
- 18.4 Remote Location Instructions:
 - 18.4.1 Notify the BPA Dispatcher and inform them of the location (including the county) and nature of the accident.
 - 18.4.2 Supervisors will ensure that all employees are informed of procedures for summoning emergency medical services at their work locations. Dispatch is to be notified as soon as possible.
 - 18.4.3 While awaiting medical response, employees should stabilize and care for the injured (to the extent of their First Aid training). Do not attempt to move the injured person unless they are at risk of further injury from hazards at the scene or directed to do so by medical personnel.
 - 18.4.4 Assist EMS personnel in arriving at the accident scene. If available, a crewmember may be sent to meet EMS at a main road crossing, intersection or landmark to have medical personnel follow them to the scene.
- 18.5 Return to Duty: Employees involved in an electrical contact injury must be evaluated for return to work in accordance with their company policy.

19. Ground Grid:

- 19.1 At BPA non-energized communication sites, the installation of ground grids and any connections to the ground grid are not considered electrical work. The Contractor will have experience installing lightning protection ground grids and will be adequately trained and familiar with the safety-related work practices involved with such installations.
- 19.2 Installation or repair of ground grids in energized facilities or counterpoise on transmission line rights-of-way, and any connections to these ground grids, are considered electrical work. These installations will be performed by a qualified person of a licensed electrical Contractor. The licensed electrical Contractor will have experience working in energized facilities and/or on transmission line projects.
- 19.3 The use of dielectric gloves is required when operating substation gates that have been identified to have insufficient ground grid protection when being operated. BPA maintains a database for the gates that may pose a hazard when operated. Signs identifying the required mitigation measures for safety have been placed on these gates.

References: The BPA Substation Maintenance Standard SM-STD-13-1-5, *Precautions When Contacting the Substation Ground Grid or When Excavating*.

20. Grounding:

- 20.1 The Contractor is responsible for protecting workers from sources of power system energization. Grounding of lines or equipment may be required to accomplish this. Sources of energization include but are not limited to:
 - 20.1.1 Electromagnetic or capacitive voltages coupled from adjacent energized lines or bus as well as electrostatic voltages from electrical charges carried by wind, dust, etc.;
 - 20.1.2 Back feed through station service or potential transformers;
 - 20.1.3 Remote lightning causing a fault on an adjacent circuit or a strike to the de-energized circuit.

Note: Portable protective grounds may not provide complete personal protection for close-in strikes. See Section 24 below for lightning curtailment requirements.

- 20.1.4 Accidental energization from the power system, power lines or other energized high voltage equipment by accidental contact or accidental closing of an isolating device.
- 20.1.5 Trapped charges such as in capacitors or on transmission lines.

A grounding plan will be developed for all work that takes place entirely on or entirely off the ground grid to mitigate 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 BPA Clearance Holder must review the specific methods used to mitigate the hazard(s) prior to starting this phase of work.

- 20.2 In energized facilities, when (PPGs) 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 will be bonded and tied to ground by application of either discharge grounding cables or portable protective grounds.

- 20.3 Construction Power, such as portable generators will be grounded and utilized in accordance with BPA Substation Maintenance Standard and Guides: SM-STD-13-1- 9, *Protecting Against Transferred Potential Hazards*; SM-STD-13-1-13, *Grounding Precautions*; and SM-STD-13-1-17, *Adding To & Expanding Substation Ground Grids*. These documents are available upon request.
- 20.4 When installing new lines or equipment that have not been connected to the BPA power system and have not been released to BPA Operations:
- 20.4.1 The lines or equipment will be tested/verified for the absence of nominal voltage,
 - 20.4.2 The lines or equipment are bonded or grounded as necessary, and
 - 20.4.3 Adequate clearances or other means must be implemented to prevent contact with any nearby energized lines or equipment and the new lines or equipment.
- 20.5 All normally energized conductors and equipment connected to the power system will be treated as energized until a clearance is in place, the line or equipment has been confirmed by audible device testing to be de-energized, and then grounded with a portable protective ground. No workers or equipment will come within the applicable Minimum Approach Distance unless these provisions are met.
- 20.6 Cutting or separating equipment components or circuit parts (e.g., bus, lines, etc.), that are part of a grounded circuit, could expose a worker to a possible difference of potential. In this case, the components will be bonded together and tied together to a common ground prior to separation and while working on the separated parts.
- 20.7 Portable Protective Grounds (PPGs) will be installed to protect persons from the hazards of accidental energization from any source of power system energization. PPGs will be applied before a worker or equipment contacts or comes within the MAD of the circuit.
- 20.7.1 For Each Clearance: Before workers or equipment contact or come within the Minimum Approach Distance MAD of a circuit, separate PPGs will be installed for each Clearance issued.
- 20.8 A PPG should consist of a ground lead of flexible 2/0 copper cable, or an equivalent. Exceptions to this requirement are defined as:
- 20.8.1 Permanently installed ground switches on gas insulated equipment, capacitors and reactors A BPA Qualified Electrical Employee will be consulted prior to using any permanently installed ground switches in lieu of PPG's. Certain restrictions apply before they can be used in lieu of PPG's.
 - 20.8.2 Grounding plugs, at least equal in rating to the required portable protective ground lead(s) and designed for the metal-clad/switch-gear involved, may be used in lieu of portable protective grounds.
 - 20.8.3 1/0 Underground Residential Distribution (URD) grounds for grounding, where appropriate, of URD equipment.
- 20.9 Grounding for personal protection will not be accomplished through vehicles, equipment, or rigging components.
- 20.10 Any reference to portable protective grounds will 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 will not be effected through a ground grid or other concealed conductors.

20.11 Multiple portable protective grounds 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 project construction specification Section 01 35 27 – BPA Safety Requirements.

20.12 When performing line work at the structures, crews and all others working on conductors, sub-conductors, or overhead ground conductors will be protected by a 3-phase short to a common ground installed on the conductors being worked on at each work location.

21. Grounds, Portable Protective, Static Wire:

21.1 Before touching or coming within the MAD of any overhead static (ground) wire, unless an approved barrier is in place, it must be grounded at that location by a portable protective ground.

Note: Human External Cargo (HEC) work on an overhead static wire does not require a PPG as long as the worker is insulated from any other conductor and the worker is bonded onto the overhead static wire.

Note: Some overhead ground wires on the BPA system are insulated and energized at primary voltage to supply airway lighting circuits and cell sites. A Clearance must be obtained and grounds installed before workers can come within the MAD of these lines.

21.2 When multiple crews are working on the same line section, direct radio communications will be maintained between crews to monitor activities, and measures taken to mitigate potential interference/hazardous working conditions.

21.3 Workers will 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 will be disconnected from the conductor end first. The conductor ends from that same set will 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 will be connected and disconnected with live-line tools.

21.4 PPGs installed at multiple locations can cause circulating currents and hazardous voltages. These conditions can change due to line loading on adjacent lines, weather, ground conditions and the installation and removal of additional grounds.

21.5 The Contractor will continuously monitor step and touch voltages (using step and touch measuring equipment) and changing conditions as needed to ensure worker safety. Information on the step and touch measuring kit BPA uses can be found in BPA Transmission Line Maintenance Standard TLM-STD-1-1-4, *Grounding BPA Transmission Lines, Equipment and Structures*, which will be made available upon request.

22. Grounding of Power/Lift Equipment:

22.1 When a vehicle is parked near energized high-voltage equipment, there can be a risk to a person 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.

22.1.1 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.

22.2 Manlifts, cranes, and other overhead lift equipment working in proximity to energized lines or equipment where there is a possibility of violating the MAD, or where the possibility of accidental contact with normally energized high voltage parts exist, will be connected to the substation ground mat within energized switchyards, or to a ground rod in other locations, with a 2/0 copper ground lead. Multiple ground leads, attached to separate ground rods or mat connections, will be utilized on equipment in the same number that would be required for grounding the circuits.

22.2.1 Ground Mat Connected Equipment: If the possibility of contact with normally energized high voltage parts does not exist, power/lift equipment will be grounded with a single 2/0 copper or static ground.

22.3 Equipment working within the MAD of cleared and grounded circuits will be at the same potential as the circuits that are being worked on. They will be bonded and tied to a common ground as required, to create an effective equipotential zone.

22.4 See BPA Substation Maintenance Standard SM-STD-13-1-15, *Grounding Work Equipment & Vehicles in Substations*, which is available upon request.

23. Extension Cords, Tools, and Metallic Cables:

23.1 When an extension cord is used in an energized switchyard, the cord's grounding box must be clamped to a solidly grounded fixture before the extension cord is connected to a switchyard receptacle. If a solidly grounded fixture is not available within 10 feet of the worksite, the grounding box will be attached to a ground rod. When using double-insulated tools, work may be done within 25 feet of the grounding box.

23.2 The BPA Substation Maintenance Standard SM-STD-13-1-9, *Protecting Against Transferred Potential Hazards*, for grounding box requirements ("Eartha-Kits") is available upon request.

23.3 Extension cords or other metallic cable (i.e., telephone or temporary power) used in a switchyard should not be laid parallel to high voltage bus or overhead circuits due to the possibility of high induced voltages. These cables will not be extended to locations off the substation ground mat unless a properly designed and installed ground mat extension or isolation is used.

24. Lightning Work Curtailment:

24.1 Work will be suspended and personnel will 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.

24.2 Employees may return to work after the Supervisor assesses the work environment and deems that it is safe to do so.

25. Minimum Approach Distance (MAD):

25.1 The Contractor will not perform any work on energized BPA high voltage conductors or equipment and will not come within the MAD of energized lines or equipment except under the provisions of the Clearance with all conducting parts shorted and bonded together to a common ground.

25.2 Do not allow equipment, machinery, and vehicles traveling on BPA's right-of-way to come within 25 feet of any BPA transmission line structure or guy wires unless:

25.2.1 Spotters are used to ensure safe work distances from structures.

- 25.3 Inside the fence – All conductors and equipment will be treated as energized unless the Contractor has been informed by the qualified BPA Clearance Holder at their work site that the line or equipment is de-energized and a clearance has been issued with all conducting parts shorted and bonded together to a common ground. These conditions will be met for the Contractor to perform their work.

Outside the fence – All line conductors and equipment located outside of a substation will be treated as energized unless the Contractor has been informed by a Qualified BPA Clearance Holder or Qualified Contractor Clearance Holder at their work site that the line or equipment is de-energized and a clearance has been issued with all conducting parts shorted and bonded together to a common ground. These conditions will be met for the Contractor to perform their work.

- 25.4 All overspray will be considered conductive. Wind and other conditions will be taken into account to ensure that the MAD is not violated by overspray or equipment (e.g., herbicide application/painting in a substation).

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

25.5.1 Approved barriers;

25.5.2 Use of live-line tools;

25.5.3 Clearance with all conducting parts shorted and bonded together to a common ground. See Section 20.5 for grounding requirements.

25.5.4 Lockout/Tagout (on voltages 600V and below).

- 25.6 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.

- 25.7 Only persons qualified and trained to perform work safely on or in close proximity to energized lines and equipment will be allowed to work or operate equipment up to the applicable MAD tables.

- 25.8 The distances in the following tables meet the minimum requirements prescribed by OSHA 1910.269. 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 A, Table B, and Table C provide the AC MAD’s based on three elevation categories as listed in the heading of each table and will be applied based on the elevation of the work site. The referenced Work Standard is available upon request.

Note: The tables below are dated 1 November 2019.

Table A – AC MAD for Qualified and Restricted Electrical Workers – Elevations 0’ to 3000’

Table A - MAD for Elevations 0’ to 3000’			
Nominal System Voltage Phase to Phase (kV)	Phase-Ground MAD (1)		Phase-Phase MAD (1)
	MAD Without Hold Order & NO Tools	MAD With Hold Order for Tools	MAD With Hold Order for Tools
50 – 300 V	Avoid Contact		
301 – 750 V	1’-1”	1’-1”	(2)
751 V - 5 kV	2’-1”	2’-1”	(2)
15	2’-2”	2’-2”	(2)
34.5	2’-7”	2’-7”	(2)
69	3’-4”	3’-4”	(2)
115	3’-6”	3’-2”	4’-1”
138	4’-0”	3’-4”	4’-6”
161	3’-8”	3’-8”	5’-0”
230	6’-2”	4’-5”	6’-8”
287	5’-2”	4’-11”	7’-9”
345	5’-11”	5’-9”	9’-10”
500 (100” Design)	8’-8”	7’-6”	14’-6”
500 (All Others) (4)	9’-10”	7’-6”	14’-6”
500 Series Caps (3,4)	11’-3”	11’-11”	24’-1”

Table B – AC MAD for Qualified and Restricted Electrical Workers Elevations 3001’ to 6000’

Table B - MAD for Elevations 3001’ to 6000’			
50 – 300 V	Avoid Contact		
301 – 750 V	1’-1”	1’-1”	(2)
751 V - 5 kV	2’-1”	2’-1”	(2)
15	2’-4”	2’-4”	(2)
34.5	2’-9”	2’-9”	(2)
69	3’-7”	3’-7”	(2)
115	3’-9”	3’-3”	4’-4”
138	4’-3”	3’-5”	4’-9”
161	3’-10”	3’-10”	5’-4”
230	6’-7”	4’-9”	7’-1”
287	5’-4”	5’-3”	8’-3”
345	6’-4”	6’-0”	10’-6”
500 (100” Design)	9’-3”	8’-0”	15’-7”
500 (All Others) (4)	10’-6”	8’-0”	15’-7”
500 Series Caps (3,4)	12’-0”	12’-9”	25’-11”

**Table C – AC MAD for Qualified and Restricted Electrical Workers
Elevations 6001' to 9000'**

Table C - MAD for Elevations 6001' to 9000'			
50 – 300 V	Avoid Contact		
301 – 750 V	1'-1"	1'-1"	(2)
751 V - 5 kV	2'-1"	2'-1"	(2)
15	2'-6"	2'-6"	(2)
34.5	2'-11"	2'-11"	(2)
69	3'-9"	3'-9"	(2)
115	3'-11"	3'-5"	4'-8"
138	4'-5"	3'-8"	6'-6"
161	4'-0"	4'-0"	5'-7"
230	6'-11"	4'-11"	7'-5"
287	5'-7"	5'-5"	8'-8"
345	6'-8"	6'-4"	11'-1"
500 (100" Design)	9'-9"	8'-5"	16'-5"
500 (All Others) (4)	11'-0"	8'-5"	16'-5"
500 Series Caps (3,4)	12'-8"	13'-5"	27'-4"

Notes — Minimum Approach Distances — Special Conditions for AC and DC:

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) will have secured any moveable parts (i.e. buckets, forks, load lines, loads) that could reduce clearances.

“Avoid contact” is defined as any movement near an exposed energized conductor which could lead to contact whether it is intentional or not.

1. Phase-to-Phase work with tools in the air gap will 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.
2. Phase spacing below 115 kV will not allow adequate MAD distances to be maintained for phase to phase work.
3. 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’ MADs are the same for lines with series capacitors in service.
4. For line end series capacitors connected adjacent to a 500 kV substation, the 500 kV MAD listed for “All Others” may be used for work on series capacitor equipment.

Table D – MAD With or Without Hold Order (ft.-in)

Table D - MAD With or Without Hold Order (ft.-in)	
Insulated Overhead Ground Wire	2'-0"
Fiber Optic (OPGW or ADSS)	2'-0"
Energized Ground Wire (Airway lighting & PCS up to 14.4 kV)	2'-6"
500 kV Bare - Segmented Ground Wire	3'-9"

DC Minimum Approach Distances:

The DC MAD for Tools include a safety factor that permits the introduction of tools in the air gap to perform live-line work. The MAD stated as with and without Hold Order are the same since DC restarts (as opposed to AC reclose) do not create high system over-voltages after a fault. However, for all live-line work the DC terminal restart will be both blocked and disabled for worker protection. Deductions for floating and conducting objects for Pole – Pole MAD apply to DC clearances, refer to Note 1 following Table C for AC MAD's.

The MAD for the DC line and Celilo converter station will be based on the measured voltage at the Celilo converter terminals.

Table E – DC MAD for All Elevations

Table E - DC MAD for All Elevations			
Celilo Converter DC MAD – Normal Pole-Pole (Bi-Pole) Operation			
Column 1: Pole – Ground		Column 2: Pole – Pole (See Note 1 for AC MAD)	
Celilo Terminal Voltage (kV dc)	MAD for Tools (ft.-in)	Celilo Terminal-Voltage (kV dc)	MAD for Tools (ft.-in)
440	8'-8"	880	12'-6"
520	10'-9"	1040	15'-3"
Celilo Converter DC MAD - Monopole Operation (Metallic or Ground Return Mode)			
Pole – Ground (kV dc) (1)		Pole – Pole (2)	
80 (Return Pole)	3'-4"	600	11'-5"

For DC MAD (below 80 kV) use the distances from the AC MAD Tables corresponding to the same voltages. The AC MAD is more conservative due to larger transient overvoltage factors.

Table E – DC MAD for Batteries and All Other Circuits

Nominal Voltage (V dc)	
50 – 300 V	Avoid Contact
301 V – 69 kV	Use AC MADs

Minimum Approach Distances for Non-Permitted Persons

Non-Permitted persons approaching normally energized equipment will not enter within the distances listed in Table G, either on foot or in a vehicle, unless given the following information by a Permitted Person:

- Procedure for identifying energized equipment
- All voltages present in the yard and how to identify the voltage level of specific equipment
- Minimum Approach Distance(s)
- The hazards associated with violation of the Minimum Approach Distances

Refer to Section 8.4 of the Rules of Conduct Handbook.

Table F – MAD for Non-Permitted Persons – All Elevations

Table G – MAD for Non-Permitted Persons – All Elevations	
Nominal System Voltage (kV)	Phase-Ground (ft.-in)
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"
500 kV Bare - Segmented Ground Wire	10'0"

Persons with Electrical Worker Permits may drive motor vehicles or operate mechanical equipment near energized facilities as long as the MADs in the tables above are maintained. Refer to BPA Work Standard BPA-WS-5-1, *Minimum Approach Distance (MAD)*, Considerations for additional information on vehicle and equipment clearances and corresponding system operating conditions, is available upon request.

Persons without an Electrical Worker Permit may drive motor vehicles or operate mechanical equipment near energized facilities and must comply with the Safety Watcher requirements in Section 26, below.

Table 1 – MAD for Vehicles and Equipment

Nominal Voltage (Phase-to-Phase)	Phase-to-Ground (ft.-in)
Up to 345 kV	15'-0"
500 kV AC	20'-0"
ALL DC Facilities	20'-0"
500 kV Bare-Segmented Ground Wire	3'-9"

Table 1 is used when transporting or driving equipment under energized transmission lines under the following conditions:

1. 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.
2. A Safety Watcher is used to ensure MAD is maintained.

Table 2 – MAD from Energized Conductors for Qualified Line Clearance Tree Trimmers

Table 2 - MAD from Energized Conductors for Qualified Line Clearance Tree Trimmers	
Nominal Voltage (Phase-to-Phase)	Phase-to-Ground (ft-in)
51 – 300 V	Avoid Contact
301 – 5k 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: MADs 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	

26. Safety Watchers:

- 26.1 A Safety Watcher is an Qualified Electrical Worker who knows and understands the safety rules and the electrical hazards involved in specific work situations. Primarily, Safety Watchers are responsible for limiting the movement of personnel and/or equipment to prevent electrical contact accidents. Safety Watchers have the authority to halt the operation whenever any unsafe act or condition is imminent.

The Contractor will take adequate safety measures to protect its workers and others from induced voltages as well as direct contact. The Contractor will 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.

- 26.2 A Safety Watcher for work in BPA energized substations must be a Qualified Electrical Worker that holds a BPA Electrical Worker Permit. A Qualified Electrical Worker can be an employee of the contractor that holds a BPA Electrical Worker Permit or be a Contract Safety Watcher that holds a BPA Electrical Work Permit. Contractors may obtain a list of Contract Safety Watcher labor providers from the CO.

A Safety Watcher for work on BPA transmission lines external to an energized BPA substation must be a Qualified Electrical Worker that holds a BPA Electrical Worker Permit or a qualified line worker who holds a BPA Contractor Clearance Certification. Substation Operations maintains the Certified Contractor Directory for Contractor Clearance Certifications.

The requirements and process for obtaining an Electrical Worker Permit or a Contractor Clearance Certification are defined in the ROCH.

Safety Watchers must have the satisfactory experience and knowledge to perform their duties as a safety watcher at the high voltage facilities that they are being assigned to.

- 26.3 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 will prevail, pending review and resolution by the COR or the onsite BPA Representative.
- 26.4 A Safety Watcher will position themselves in 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, will 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.
- 26.5 A Flame Resistant (FR) rated, high visibility vest (red or orange) will 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 COR or the onsite BPA Representative in other situations requiring a Safety Watcher.
- 26.6 A Safety Watcher is required for Qualified Electrical Worker who hold a BPA issued Electrical Worker Permit under the following circumstances:

- 26.6.1 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 will be considered one structure if workers can pass from one to the other without having to descend to the ground.
- 26.6.2 When inadvertent movement by a worker could result in violating the MAD as specified in tables above as applicable.
- 26.6.3 When operating or moving motor-driven equipment in the vicinity of high-voltage circuits and the possibility of accidental contact exists.
- 26.6.4 Whenever the COR, the onsite BPA Representative, or Contractor requires a Safety Watcher.
- 26.7 Safety Watchers for non-qualified workers and workers holding a BPA issued Non-Electrical or Restricted Electrical Worker Permit will be required:
 - 26.7.1 Whenever a Safety Watcher is required for Qualified Electrical Worker.
 - 26.7.2 Whenever a Clearance is necessary for the accomplishment of the work.
 - 26.7.3 When operating or moving motor-driven equipment in an energized substation yard which are not guarded or barricaded to prevent violation of the MAD indicated in Table 1, Section 25, above.
 - 26.7.4 Any time the COR, the onsite BPA Representative or Contractor requires a Safety Watcher and/or Escort Plan.
- 26.8 Safety Watcher and/or Escorting Plan: Work in energized substations and facilities may require one or more Safety Watchers and/or Escorts. As a part of the Safety Plan, the Contractor will consult with a Qualified Electrical Employee (familiar with work in high-voltage facilities). The Contractor will provide a detailed plan for their use including the work areas and the number of safety watchers and/or escorts assigned.

27. Environmental Hazards:

- 27.1 The Contractor should contact the COR 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 COR prior to disturbing the subject materials.
- 27.2 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 will 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 will be developed and submitted to the BPA Safety Organization for review and comment.
- 27.3 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.

- 27.4 When respirators are required, Contractors will prepare a written respiratory protection program.
- 27.5 The Contractor will conduct occupational exposure assessments/measurements.

28. Equipment and Rigging:

- 28.1 Custom fabricated tools or rigging equipment must be designed by a Registered Professional Engineer (RPE), marked to indicate the working load limit (W.L.L.), and proof tested to 125% of the W.L.L. prior to being used in the field.
- 28.2 The Contractor will 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. The Contractor will document their rigging inspection process and make it available to BPA personnel upon request.
- 28.3 Lifting and Hoisting using Cranes and/or Excavators: Contractor will develop and review a Lift Plan with all site workers in advance of any lift or series of lifts. For Critical Lifts Contractor will develop and submit a Critical Lift Plan to the BPA Safety Organization for review and acceptance, prior to performing the work. See BPA Critical Lift Plan Requirements.
- 28.4 Critical lifts are defined as:
 - 28.4.1. The load weight is over 75% of the cranes* rated capacity for the current configuration.*
 - 28.4.2 The Lift is occurring above or within proximity of existing electrical equipment where the minimum approach distance has the potential to be violated. Refer to Table 1.
 - 28.4.3 Lifts out of view of the Operator.
 - 28.4.4 Lifts over, or in close proximity to Railroad tracks or trestles. Lifts over, or in close proximity to highways or heavily travelled roadways.
 - 28.4.5 The Lift requires two or more cranes or other lifting devices.
 - 28.4.6 Lifts that require hoisting of workers on a suspended work platform or man basket.
 - 28.4.7 Loads to be lifted in close proximity to high voltage conductors, towers or equipment.
 - 28.4.8 Lifts in highly congested work areas where other workers are in close proximity to the Lift Zone.
 - 28.4.9 Lifts where the Load Weight is not known.
 - 28.4.10 Lifts that the Operator determines to be a Critical Lift.

*Note: The use of the word crane also includes all other lifting devices that will perform Critical Lifts. This includes large excavators and truck-mounted booms, and all other related load handling equipment.

- 28.5 Load lines will not be detached from a tower section until the section is adequately secured. Unless otherwise designated by the COR or the onsite BPA Representative, "adequately secured" is defined as having 50% or more of the attaching bolts in place. Loads will not be released until all tower legs are secured. Line workers will not tie-off to unsecured tower sections, and will not climb on to unsecured tower sections. These provisions will apply to all methods of tower erection.
- 28.6 Use of aerial lifts, manufactured hook ladders, platforms, or similar devices will be considered approved methods for clipping or dead ending conductor, and related work processes. Crawling over insulators (suspension or dead end) will not be considered an approved practice unless all of the following conditions are met:
- 28.6.1 Alternate means were impractical or created a greater hazard;
 - 28.6.2 100% fall protection methods are used;
 - 28.6.3 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;
 - 28.6.4 Climbing over dead end assemblies is permissible only after they have been completed and pinned in their final position.
- 28.7 For the safety of equipment operations, guy wires will be flagged before work commences.
- 28.8 With respects to Vegetation Management work, all rigging or equipment used to control a tree's fall will be adequately anchored, sized and positioned to control the weight of the tree and positively control the direction of fall.
- 28.9 When using rigging to pull "leaners" over center, mechanical methods will be employed and sized appropriate to the weight and position of the tree. Rigging used for this methodology must be approved by the manufacturer for identified configurations.
- 28.10 At winds greater than 20 mph, the Operator, Rigger, and Lift Supervisor will cease all operations, evaluate conditions and determine if the lift will proceed. Determination to proceed will be documented in the Operator's logbook.

29. Spill Kits:

- 29.1 All Contractor and Subcontractor work crews will have spill kits readily available during construction activities. Spill kits will be stocked and sized appropriately for types of spills that could occur.
- 29.2 The Contractor will provide training to employees on the type/sort of hazards employees might be required to address. The training program will address competencies required for different levels of response.

30. Fall Protection:

- 30.1 Fall protection requirements are applicable for Contractors working at elevated locations more than 4 feet above a lower level except on portable ladders or fixed ladders less than 24 feet. Fall protection equipment will meet all applicable consensus standards. Employees exposed to fall hazards will be protected from falling to a lower level by the use of standard guardrails, handrails, work platforms, temporary floors, safety nets, engineered fall protection systems, personal fall arrest systems, or the equivalent.

- 30.2 Contractors working in an aerial lift or on platforms supported by lift equipment will wear approved Personal Protective Equipment (PPE) consisting of a full body harness and attached with either a self-retracting device or shock-absorbing lanyard.
- 30.3 During work activities above 4 feet that requires fall protection PPE, Contractors will ensure that at least 2 qualified workers are present at the work site for rescue purposes. Contractors will contact local first responder agencies to assure that qualified personnel and necessary equipment is available to respond to the 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 will include a formal and Site Specific Fall Protection Rescue Plan as a part of the submission of the project SP.
- 30.4 Contractors working at elevated locations more than 4 feet above the ground and utilizing fall protection PPE will wear an approved climbing style helmet attached with chinstrap.
- 30.5 Contractors performing work at a height of 10 feet or greater will have a written, Site Specific Fall Protection/Rescue Work Plan, reviewed by the BPA Safety Organization as part of their SP submittal, prior to the commencement of work.
- 30.6 Contractors will ensure that portable ladders are inspected and contain no defects, be adequately secured, extend at least 3 feet above any upper landing surface, and not be loaded past their manufacturer's rated load capacity.
- 30.7 Working Over or Near Water. Unless continuous fall protection is used without exception, where the danger of drowning exists; (e.g., rivers, piers, wharves, quay, walls, barges, watercraft, aerial lifts, crane-supported work platforms, etc.). Use barriers to separate the worker from water hazard OR provide U.S. Coast Guard approved personal flotation devices (PFD) and place ring buoys with at least 90 feet of line at each 200 feet of work area. Buoyant work vests or life preservers will be inspected for defects, which would alter their strength or buoyancy. At least one lifesaving skiff will be immediately available at locations where employees are working over or adjacent to water.

31. Fiber Optics:

- 31.1 Never look into the end of an optical fiber. The laser light that may be present is invisible and eye damage may occur.
- 31.2 When working with fiber optics, the use of personal protective equipment is required to prevent injury. Eye protection will 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.
- 31.3 Chemicals that are present in fiber or the chemical used to clean fiber may require the use of hand protection. Consult the Safety Data Sheet (SDS) for proper use of personal protective equipment. Reference BPA Work Standard BPA-WS-9-3, *Fiber Optics*, which is available upon request.

32. Fire Hazards:

- 32.1 Fire prevention and suppression will comply with project construction specification Section 01 35 27 – BPA Safety Requirements.
- 32.2 Flammable liquids within 70 feet of conductors energized at voltages of 345 kV and higher will not be transferred from one metal container to another unless the two have been electrically bonded together to eliminate arcing.

- 32.3 Metal safety cans are an approved container of not more than 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 Underwriters Laboratory (UL) or Factory Mutual (FM) approved will 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.
- 32.4 Fuel storage will not take place under or adjacent to energized lines or equipment.
- 32.5 The Contractor will be responsible for contacting the local jurisdiction having authority and being aware of and complying with any fire restrictions, shutdowns, or other special requirements.
- 32.6 The Contractor is responsible for carrying fire suppression tools and equipment as required by the authority having jurisdiction, and training workers in their use.
- 32.7 Welding, Cutting, Brazing and Grinding operations will comply with OSHA 1910.252 and/or any applicable Federal, State standard or regulation.
- 32.8 At least one portable fire extinguisher rated 20-B:C will be provided on all tank trucks or other vehicles used for transporting and/or dispensing flammable liquids.
- 32.9 Each service or refueling area will be provided with at least one fire extinguisher rated not less than 40-B:C and located so that an extinguisher will be within 100 ft. of each pump, dispenser, underground fill pipe opening, and lubrication or service area.

33. Hazard Communication:

- 33.1 The Contractor will supply workers with effective information and training regarding any hazardous chemicals used at the work site and will comply with OSHA 1910.1200, 1910 Subpart Z, and/or any applicable Federal, State standard or regulation.
- 33.2 The Contractor will develop a written Hazard Communication program when hazardous or toxic agents are present or procured, stored or used at the project. The Contractor will maintain any required Safety Data Sheets (SDS) at the work location and have them available to workers.
- 33.3 For emergency response purposes, approximate quantities that are onsite or will be on site at any given time will be provided for each material. A site map will be attached to the inventory showing/identifying where inventoried substances are stored.

34. Job Briefing:

- 34.1 As part of the development of their SP, the Contractor will conduct and document job briefings each morning with safety as an integral part of the briefing, and will provide copies of the daily job briefing and any other safety meeting notes to the COR 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.
- 34.2 The job briefing will reflect all hazards and how they will be mitigated and controlled, as noted in the SP.

- 34.3 The person-in-charge of the job will conduct job briefings with all workers assigned to the job. Job briefings will be held at the work site with additional briefings conducted for late arriving workers, workers that were not present during the initial job briefing, and when work situations change that may pose different or additional hazards to workers. Workers working alone will 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.
- 34.4 All job briefings must cover, at a minimum, the following subjects:
- 34.4.1 Hazards associated with the job;
 - 34.4.2 Work procedures;
 - 34.4.3 Special precautions;
 - 34.4.4 Energy source controls;
 - 34.4.5 Personal protective equipment;
 - 34.4.6 Clearances, Hold Orders, and Work Permits;
 - 34.4.7 Emergency procedures/communications;
 - 34.4.8 Special permits (e.g., confined space; fall protection plans, etc.);
 - 34.4.9 Worker training and qualifications.

35. Lockout/Tagout (LOTO) – Control of Hazardous Energy:

- 35.1 The Contractor will communicate and familiarize their workers and affected BPA employees with their respective LOTO locks, tags, devices and procedures.
- 35.2 The Contractor will ensure that no workers are exposed to injury from the unexpected startup or release of stored energy systems.
- 35.3 Contractors performing work on machinery or equipment where such hazards may exist will develop a LOTO program in accordance with this section as well as the requirements of 29 CFR 1910.147, The Control of Hazardous Energy (Lockout/Tagout), ANSI Z244.1, Control of Hazardous Energy Lockout/Tagout and Alternative Methods, and ANSI A10.44, LOTO for Construction. This document will be submitted as part of their SP submittal to the BPA representative, for their review and acceptance.
- 35.4 The Contractor will supply all required locks, tags, and devices required for locking out and tagging the machinery or equipment to be worked on.

36. Medical Services and First Aid:

- 36.1 First aid kits will be accessible to all workers and protected from the weather. The individual contents of the first aid kits will be kept sterile. First aid kit locations will be clearly marked and distributed throughout the site(s).
- 36.2 The contents of first aid kits will be checked by the employer prior to their use on

site and at least every 3 months when work is in progress to ensure that they are complete, in good condition, and have not expired.

- 36.3 All employees who work where there is a first aid kit will receive training on the content and use of the first aid kit supplies.
- 36.4 The placement of Automatic External Defibrillators (AEDs) is optional but highly recommended. The placement of AEDs on the worksite will be preceded by an assessment of the time and distance to emergency medical services (EMS) and a justification for such equipment.
- 36.5 Workers required to use an AED will be trained on the proper use and functionality of the AED. All classes will contain a hands-on component and cannot be taken online. Training will be on the same model and manufacturer of AED available in the work area. The certificate(s) will state the date of issue and length of validity.

37. Personal Protective Equipment (PPE):

- 37.1 The Contractor will furnish all required safety and personal protective equipment. All persons on all projects will wear non-conductive hard hats meeting the requirements of OSHA/ANSI.
- 37.2 Yellow hard hats with company logo are restricted to workers who hold a BPA Qualified Electrical Employee Permit.
- 37.3 Qualified Line Clearance Tree Trimmers (QLCTT) will wear red hard hats.
- 37.4 All others will wear white hard hats.
- 37.5 Appropriate footwear that provides adequate support and protection to the foot, toes and ankles for the work being performed will be worn. Lace-up, over the ankle boots with rigid sole and heel meeting ASTM F2413 with an EH rating will be worn in all work areas where hard hats are required and other areas as determined by a Supervisor. Supervisors have the responsibility for ensuring that appropriate footwear is worn. Workers have the responsibility to wear appropriate footwear for the job.
- 37.6 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, will 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.
- 37.7 The Contractor will ensure that workers operating All-Terrain Vehicles (ATVs) on BPA right of ways will be trained on the safe operation of the specific ATV being operated and that they wear a helmet and protective eyewear, as required. State ATV operator requirements in which the work is occurring must also be met.
- 37.8 All workers performing the following work, or working in the following areas, of a substation will wear dielectric boots:
 - 37.8.1 Contacting the ground grid;
 - 37.8.2 Work in areas with standing water above the yard rock;
 - 37.8.3 Work in areas without yard rock when subgrade is wet and muddy, or it is raining. Dielectric gloves are recommended if the ground grid will be repeatedly touched.
- 37.9 For PPE related to Arc Flash Hazards see Section 12, above.

38. Radio Frequency Exposure, for Personal Communication Systems:

- 38.1 Radio Frequency (RF) emissions can be harmful to workers within RF fields of high exposure levels. BPA has established a safe working distance of 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 will the exposure exceed 6 minutes in any 15-minute period.

- 38.2 BPA structures at communications sites such as radio stations and substations may have antennas that may be energized without notice. A personal RF monitor will 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.
- 38.3 The 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 5 feet. Any antenna that requires a minimum safe working distance greater than 5 feet will have a warning sign posted to indicate the safe working distance.
- 38.4 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 6 minutes in a 15-minute period, the worker will contact the foreign adjacent site owner and request a reduction in transmit power level while work is in progress.
- 38.5 Vehicle-mounted transmitting antennas have a safe working distance of 2 feet while transmitting. The exposed metal parts of a vehicle-mounted transmitting antenna will never be touched while transmitting as it will produce a painful burn on bare skin.

Reference: BPA Work Standard BPA-WS-11-5, Communication Antennas – *RF Exposure*, which is available upon request.

39. Toilet Facilities:

- 39.1 The Contractor will furnish an adequate number of portable toilets for their workers.
- 39.2 Where it is not practical to provide running water, hand sanitizers may be used as a substitute for running water. Hand sanitizers must contain at least 60% ethyl alcohol as its active ingredient and workers will be trained to properly use the sanitizer.

40. Traffic Control:

- 40.1 The Contractor is responsible for ensuring that all traffic control measures required by Federal, State, and local laws and regulations are followed and that they conform to the Federal Highway Administration, Manual on Uniform Traffic Control Devices MUTCD (latest edition).
- 40.2 All flaggers will have in their possession an appropriate State certification card attesting to having completed the required training.
- 40.3 High-visibility apparel meeting, at a minimum ANSI/ISEA 107, Class 3, will be worn by all flaggers.

41. Trenching and Excavation:

- 41.1 Excavation and trenching must conform to all applicable Federal and State trenching, shoring and excavation safety standards. The excavation/trenching plan will be prepared by the Competent Person (CP) for excavation or a Registered Professional Engineer (RPE), submitted and accepted by the BPA assigned Safety Manager prior to beginning operations.
- 41.2 The Contractor will have a competent person on site that is capable of identifying existing and predictable hazards, and has the authority to take prompt corrective action.
- 41.3 Prior to entry into excavations 4 feet or more in depth an Excavation/Trenching Permit completed by the competent person and approved by the Supervisor will be posted on site. The Contractor will use BPA form F 5480.28e, *Excavation/Trenching Permit*, or an equivalent form approved by the BPA.
- 41.4 Excavations 4 feet or more in depth will not be entered unless sloped to the appropriate angle of repose, shored or shielded.
- 41.5 The Contractor is responsible for obtaining all necessary locates before any work commences. The Contractor will 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.

42. Welding:

- 42.1 The 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.
- 42.2 The welder on the job will notify all workers that could be exposed to hazards involved in an arc welding process to remain in the clear or be isolated.
- 42.3 Workers will not contact pieces being welded unless the pieces are electrically bonded together and a solid ground path to the welding machine is used.

43. Work Permits:

- 43.1 A Work Permit is dispatcher permission to work on power system equipment or circuits that do not require a Clearance or Hold Order. A Work Permit does not provide electrical contact protection for personnel or permit the violation of applicable Minimum Approach Distances.

43.2 Work Permits are required for all work on power system equipment, including fiber optic work that may affect the operation or protection of the power system.

43.3 Work Permits will only be issued to Contractors who hold a Restricted Electrical Worker Permit, or an Electrical Worker Permit, and are on the Approved Contractor Energized Facility Work Permit Holders list. BPA Work Standard WS-3-9, *Approving Contractors to Hold Work Permits*, provides the detailed information to complete the process. It is available upon request.

43.4 Work Permit Responsibilities. The person receiving the Work Permit:

43.4.1 Will know the exact name of the line or equipment included in the Work Permit, the time of issue of the Work Permit, and the name of the Dispatcher who issued the Work Permit.

43.4.2 Will verbally convey this information to all persons working under the Work Permit.

43.4.3 For work in substations, will remain at the substation while work requiring the Work Permit is being completed. If the purpose of the Work Permit is for end-to-end terminal work, such as for relay or communications equipment, the holder of the Work Permit will be at one of the terminals where work is occurring under the Work Permit.

43.4.4 For work on transmission lines, will remain at the location where the work requiring the Work Permit is located.

43.4.5 Will maintain a method of communication with the Dispatcher for the duration of the Work Permit. To ensure the integrity of process is maintained, communications will consider the following format:

43.4.5.1 When communicating about Work Permits and Trouble Reporting, personnel will identify themselves to each other and be confident they know with whom they are talking.

43.4.5.2 Conversations must be clear, concise, and will be conducted in a business-like manner. Conversations may be held through a third party when necessary.

43.4.5.3 Personnel must exchange information using proper line and equipment terminology so that all parties have a clear understanding of the work to be performed.

43.5 Work Permit Application, Issuance, and Release:

43.5.1 The application for a Work Permit is coordinated with the BPA COR or BPA Field Representative with as much advance notice as possible. The following information will be provided for the Work Permit request:

43.5.1.1 The correct name designation of the line or equipment requiring a Work Permit.

43.5.1.2 The date and time the work requiring the Work Permit is scheduled to begin.

43.5.1.3 The anticipated duration of the Work Permit.

Note - Work Permits are issued and released on a daily basis – not continuous.

43.5.1.4 The name of the person who will take the Work Permit.

43.5.1.5 A description of the work to be performed.

43.5.1.6 The means of communication with the Work Permit Holder while the work is performed.

43.6 Issuance of Work Permits:

43.6.1 All Work Permits on the BPA power system will be issued by a BPA Dispatcher.

43.6.2 When issuing a Work Permit, the Dispatcher will state clearly to the person receiving the Work Permit:

41.6.2.1 The name of the person receiving the Work Permit;

41.6.2.2 The exact name of the line or equipment included in the Work Permit;

43.6.3 When receiving a Work Permit, the recipient of the Work Permit will repeat back to the Dispatcher:

43.6.3.1 The name of the person receiving the Work Permit;

43.6.3.2 The exact name of the line or equipment included in the Work Permit.

43.7 Releasing Work Permits:

43.7.1 All Work Permits must be promptly released to a BPA Dispatcher, when the work is complete or at the end of each work day.

43.7.2 When a Work Permit is released the Dispatcher must be informed of the status of the equipment, i.e. the equipment is ready for service or the equipment will remain out of service.

43.7.3 Upon acceptance of the release the Work Permit no longer exists.

43.7.4 If the holder of the Work Permit is unable to release a Work Permit, the immediate Supervisor of that Work Permit Holder will communicate with the crew, release the Work Permit, and designate the person who will receive the new Work Permit.

43.8 Task Briefings. The Work Permit Holder will hold task briefings with all persons working under the Work Permit immediately prior to starting work covered under a Work Permit.

43.8.1 The briefing will include a review of:

43.8.1.1 The scope and equipment covered in the Work Permit;

43.8.1.2 Any specific details or work procedures associated with the work.

43.8.2 The briefing should be documented and available for review by the COR or BPA Field Representative. The briefing notes should identify:

43.8.2.1 Work Permit Holder;

43.8.2.2 When the Work Permit was issued, and who issued it;

43.8.2.3 Steps taken to identify the work area;

43.8.2.4 Work being performed;

43.8.2.5 Work that cannot be performed.

CHAPTER 2 – WORK IN SUBSTATIONS AND RELATED BPA FACILITIES

In addition to the requirements of Chapter 1, the following specific work requirements apply.

1. Minimum Qualifications for Qualified Electrical Worker (QEW):

The Contractor will ensure that all QEWs meet the following:

- 1.1 Documented Department of Labor (DOL) approved apprenticeship certificate, an Electrical Engineering degree, or an engineering degree in a related field (e.g., field engineer, commissioning and testing field engineer).
 - 1.1.1 Relevant training consisting of on-the-job and electrical theory;
 - 1.1.2 Qualified by experience or training to perform the specific type of work outlined in this contract;
 - 1.1.3 Completed in the past 2 years a grounding/bonding training course that includes appropriate grounding techniques, step and touch, and the creation of an equipotential zone;
 - 1.1.4 Have a current First Aid/CPR/AED card;
 - 1.1.5 Be fluent in the English language as well as the language(s) of Contractor workers under their Supervision;
 - 1.1.6 The Contractor will make available, upon request by the Contracting Officer or authorized representative of the Contracting Officer, documentation verifying the QEWs qualifications.

2. 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.

- 2.1 BPA electrical workers will clear and tag the equipment. A Clearance will then be issued to the BPA Clearance Holder. The BPA Clearance Holder will:
 - 2.1.1 Know the limits of the Clearance, the facilities included, and the status of ground switches within the Clearance. The Clearance Holder will also know the Clearance number, the time of issue and the name of the Dispatcher or Substation Operator who issued the Clearance;
 - 2.1.2 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;
 - 2.1.3 Review the Contractor's grounding plan in the SP with the crew foreman and either concur with the plan or modify, and upon acceptance direct the placement of ground(s);
 - 2.1.4 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;
 - 2.1.5 Direct the utilization of Safety Watchers as required;
 - 2.1.6 Convey this information to all persons working under that Clearance before work begins. In addition, any specific hazards associated with the work will be pointed out;

- 2.1.7 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".

2.2 The Contractor will:

- 2.2.1 Know the limits of the Clearance, the facilities included, and the status of ground switches within the Clearance. The Contractor will 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 will understand any specific hazards that may be associated with the work;
- 2.2.2 Know that all low-voltage isolating device air circuit breakers (ACB) 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;
- 2.2.3 Install PPGs as described in the SP or as modified by the BPA Clearance holder in consultation with the crew foreman;
- 2.2.4 Install barriers and guards as directed by the Clearance Holder;
- 2.2.5 Utilize a Safety Watcher when one is required;
- 2.2.6 Cease work on equipment under a Clearance when the Clearance Holder is not at the job site.

2.3 When Clearances Are Not Required:

- 2.3.1 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.
- 2.3.2 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 BPA-WS-3-3, *Work on Equipment Separated from the Power System*, which is available upon request.

3. Ground Grid – Substations:

- 3.1 Workers will not "come between" cut sections of substation ground grids. Separated sections of the grid will only be connected after first being jumpered using hot methods by Qualified Electrical Workers under the supervision of the COR or the onsite BPA Representative.

- 3.2 All work will 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 COR or the onsite BPA Representative must be consulted for specific methods that would minimize the hazard.

Reference: See Substation Maintenance Standards SM-STD-13-1-5, *Precautions when Contacting the Substation Ground Grid or When Excavating*, and SM-STD-13-1-15, *Grounding Work Equipment & Vehicles in Substations*, which are available upon request.

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

4. Switches, Isolating Devices, Energized, Restrictions On:

- 4.1 Work will 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 not violated. In both cases, precautions must be taken to assure that the switch cannot be operated until all work is completed.

5. Coupling Capacitors and Bushing Potential Devices:

- 5.1 Work in the base units of coupling capacitors and bushing potential devices, other than tuning or voltage adjustment will 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*, which is available upon request.

6. Current Transformer (CT) Secondary:

- 6.1 The CT secondary circuit will not be opened while the primary is energized, due to the possible development of a high secondary voltage.
- 6.2 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 will lead the job briefing and approve any wiring work, including shorting, lifting, or landing wiring on CT terminal blocks.
- 6.3 Only Qualified Electrical Workers who have completed BPA's CT Safety Training within the last 3 years will perform work on CT secondary circuits which are normally in service.
- 6.4 All work will be performed in accordance with BPA Work Standard BPA-WS-9-12, *Current Transformer Secondary Circuits*, which is available upon request.

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

In addition to the requirements of Chapter 1, the following specific work requirements apply.

1. Minimum Qualifications for Qualified Electrical Line Worker (QELW):

The Contractor will ensure that all QELWs meet the following:

- 1.1 Documented Department of Labor (DOL) approved apprenticeship certificate, an Electrical Engineering degree, or equivalent. Related training is a course of study, covering the theoretical aspects of the trade, which may be accomplished by correspondence or classroom instruction or a combination of correspondence and classroom instruction.
 - 1.1.1 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 will 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 will have sufficient experience and training to understand and safely work in proximity to the hazards posed by high voltage transmission lines;
 - 1.1.2 QELWs certified to hold a BPA Work Clearance will 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 COR, documented training may be substituted for this requirement;
 - 1.1.3 Will have completed in the past 2 years a grounding/bonding training course that includes appropriate grounding techniques, step and touch, and the creation of an equipotential zone;
 - 1.1.4 Will have a current First Aid/CPR/AED card;
 - 1.1.5 Will be fluent in the English language as well as the language(s) of Contractor workers under their Supervision;
 - 1.1.6 The Contractor will make available, upon request by the Contracting Officer or authorized representative of the Contracting Officer, documentation verifying the QELWs qualifications.

2. Minimum Crew Size:

- 2.1 When climbing structures, all work crews will have a minimum of 1 Qualified Electrical 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.
- 2.2 The minimum crew for installing PPGs will consist of 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 Electrical 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.

- 2.2.1 When applying PPGs on transmission lines, the required electrical workers will be in the structure and/or an aerial lift device and be assisted by adequate help on the ground. These required electrical workers will work closely together observing each other testing for voltage and applying PPGs. Additional PPG sets may be installed on the same circuit and all sets may be removed by one Qualified Electrical Worker and one other worker;
- 2.2.2 Additional PPG sets may be installed on the same circuit and all sets may be removed by 1 qualified line worker and one other worker.
- 2.3 All other electrical work crews will have a minimum ratio of one Qualified Electrical Line Worker to one non-qualified worker. Crews not performing electrical work or aerial work (e.g., road crews) need not comply with this requirement.
- 2.4 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.

3. Requirements for Work on Lines Physically Separated from the BPA System, Including New Construction and Return to Construction Status:

- 3.1 When Clearances Are Not Required:
 - 3.1.1 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.
 - 3.1.2 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 BPA-WS-3-3, *Work on Equipment Separated from the Power System*, which is available upon request.
- 3.2 All conductors and equipment will be treated as energized until a Letter of Return to Construction Status has been issued, and it has been tested and grounded with portable protective grounds. No worker or equipment will come within the MAD in the tables in Chapter1 unless these provisions are met.
- 3.3 De-energized conductors and equipment, which are to be grounded, will first be tested for voltage using approved methods.
- 3.4 A determination will be made by the Contractor to ensure that hazardous step and touch voltages are not present when grounding lines for worker protection.
- 3.5 New lines or equipment may be considered de-energized and worked as such where:
 - 3.5.1 The lines or equipment are grounded, or
 - 3.5.2 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.

4. Requirements for Work on Normally Energized Lines and Equipment that are Separated by an Isolating Device Under the Provisions of a Work Clearance:

- 4.1 The Contractor will not perform any work on any energized BPA high voltage conductors or equipment and will not come within the MAD of energized lines or equipment specified in the applicable MAD tables in Chapter 1.
- 4.2 A Contractor will only perform work on normally energized BPA transmission lines under the protection of a Work Clearance with all conducting parts shorted and bonded together to a common ground. See Section 20.5 for grounding requirements. 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.
 - 4.2.1 Contractor Clearance Holder: All work carried out by a Contractor under a Work Clearance or Hold Order held by a Contract worker will be governed by the Transmission Line Maintenance Standard TLM-STD-3-1-14, *Contractor Clearance, Hold Order, and Work Permit Procedure* and BPA, Clearances on Line Sections. The BPA Dispatcher will 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 accepts 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;
 - 4.2.2 Workers will 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."
- 4.3 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 BPA TLM-STD-3-1-14, *Clearances on Line Sections*, which is available upon request.
- 4.4 Clearance Holder Certification:
 - 4.4.1 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 COR. Qualified line workers must meet the minimum qualifications identified previously in this clause.
 - 4.4.2 The CO or COR will schedule the training and written exam and notify the Contractor of the time and date. Training and written examination will require approximately 8 hours to complete and may be held at various locations in the BPA system.
 - 4.4.3 A Contractor's Clearance certification expires on January 31st of each year regardless of when the certification was originally granted. Contractors will 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.

4.5 Clearance Holder Responsibilities:

- 4.5.1 Prior to the issuance of a Clearance by BPA, the Clearance Holder will request and receive a copy of the one-line diagram showing the equipment on which the Clearance will be issued;
- 4.5.2 The Clearance Holder will 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;
- 4.5.3 The Clearance Holder will remain at the job site while work or testing is being performed on equipment under a Clearance. Where the work requires workers at more than one location, the holder of the Clearance is considered to be "At the Job Site" when with a group of workers or traveling between groups of workers, provided that radio or cell phone contact can be maintained with the Dispatcher and all groups of workers.

4.6 Concurrent Clearances occur when 2 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 will be followed:

- 4.6.1 BPA-WS-6-3, *Grounding Policy*;
- 4.6.2 BPA-WS-6-7, *Multiple Clearance Hazards*;
- 4.6.3 BPA-WS-10-14, *Communications during Concurrent Work Clearances with Contractors*.

4.7 Workers will cease work on equipment under a Clearance when the Clearance Holder is not at the job site.

4.8 BPA electrical workers will clear and tag the equipment. The Contractor will then be issued a Clearance by a Dispatcher or other authorized employee and, for the protection of its workers, properly install portable protective grounds at each work site.

- 4.8.1 The Clearance Holder will 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;
- 4.8.2 A visible AC three-phase short and ground will be applied at each work site before any worker or equipment comes within the MAD of any de-energized line (as specified in MAD tables in Chapter 1 as applicable);
- 4.8.3 A work site is defined as each specific location where a task is being performed. PPGs will 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 will be taken to ensure that PPGs are not placed where they may be inadvertently knocked off or damaged by the work process;
- 4.8.4 Any reference to PPGs will 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 PPGs require, but will not be effected through a ground grid or other concealed conductors. All PPGs will be installed and removed with approved live-line tools.

- 4.9 Identification of PPGs: The Contractor will employ an adequate PPG identification and inventory system to ensure that the location and status of each identified applied PPG is positively accounted for and will inform and give positive and documented assurance to the Clearance Holder and to the BPA COR or the onsite BPA Representative of the status and location of each inventoried PPG before releasing any Clearance.
- 4.10 PPGs for each Clearance: Before workers or equipment contact or come within the MAD of a circuit, separate grounds will be installed for each Clearance issued. When grounding overhead transmission lines grounding procedures and measuring of step-and-touch voltages will be done in accordance with BPA Transmission Line Maintenance Standard TLM-STD-1-1-4, *Grounding BPA Transmission Lines, Equipment and Structures*, which is available upon request.
- 4.11 Ground Switches:
 - 4.11.1 The Clearance Holder is 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;
 - 4.11.2 At no time will a ground switch be considered a substitute for PPGs.
- 4.12 All projects restricted solely to pole and arm replacement (no conductor is being moved or replaced) will be subject to the grounding provisions contained in this section and will require the installation of an AC three-phase short and ground at each work location for worker protection.

5. Hand Lines and Rope Used in Energized Corridors:

- 5.1 The Contractor will 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 will not be left in work positions overnight.

6. Proximity of Equipment, Machinery, and Vehicles to Transmission Line Structures:

- 6.1 Equipment, machinery, and vehicles traveling on BPA's right-of-way will follow the MAD, Table 1, for any BPA transmission line structure or guy wires unless:
 - 6.1.1 Guy wires have been flagged before work commences;
 - 6.1.2 Spotters are used to ensure safe work distances from structures.

7. Counterpoise:

- 7.1 There may be buried counterpoise (a mini-ground mat) associated with the structures, and the Contractor will avoid cutting or damaging the counterpoise. Counterpoise may extend the full width of the ROW and hundreds of feet in any direction from the structures. Locates may be required to determine extents.
- 7.2 If the counterpoise is compromised in any way immediately notify the COR and onsite BPA Representative.

8. Stringing or Removing Conductor:

- 8.1 Prior to stringing operations a job briefing will 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.
- 8.2 All pulling and tensioning equipment will be isolated, insulated, or effectively grounded.
- 8.3 During stringing operations, each bare conductor, sub-conductor, and overhead ground conductor will be grounded at the first tower adjacent to both the tensioning and pulling setups.
 - 8.3.1 These grounds will be left in place until conductor installation is completed;
 - 8.3.2 Such grounds will be removed as the last phase of aerial cleanup;
 - 8.3.3 Grounds will be placed and removed with a live-line tool.
- 8.4 Each conductor, sub-conductor, and overhead ground conductor will be grounded at all dead-end or catch-off points. Work on dead-end towers will require grounding on all de-energized lines.
- 8.5 A ground will be located at each side and within 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 will be bonded to each other.
- 8.6 All conductors, sub-conductors, and overhead ground conductors will be bonded to the tower at any isolated tower where it may be necessary to complete work on the transmission line.
- 8.7 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 will not be removed until jumpers are closed.)
- 8.8 Contractors stringing over energized lines will use tension stringing methods, guards, barriers, and/or other methods to positively prevent accidental contact with those lines. Contractors will 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.

CHAPTER 4 – COMMERCIAL AVIATION SERVICES (NON- TRANSPORTATION)

In addition to the requirements of Chapter 1, the following specific work requirements apply.

1. Commercial Aviation Services (CAS) General -- Applicable to ALL CAS Operations:

- 1.1 The Contractor has sole responsibility for the airworthiness, operation, and safety of the aircraft operations and the public during the conduct of operations.
- 1.2 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.
- 1.3 Small Unmanned Aircraft Systems (sUAS) (defined as those under 55 lbs) are the only type of unmanned system currently allowed to operate under contract at BPA.
- 1.4 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.
- 1.5 All CAS vendors must be vetted by the Department of Energy (DOE) through BPA's Aircraft Services prior to the performance of any work on BPA's power system or property.
 - 1.5.1 An initial assessment, and thereafter every 2 years if a continuing need exists, will be made by the Aircraft Service Manager, their designee or DOE aviation consultant to ensure that the Contractor meets the qualifications for this contract.
 - 1.5.2 The assessment will be conducted by Bonneville Aircraft Services, their designee, or the DOE aviation consultant. The CAS vendor must provide access to, as applicable, the Contractor's General Operations Manual, Rotorcraft Load Combination Manual, General Maintenance Manual, Safety Management System document, aircraft maintenance and inspection records, pilot training records, and key management personnel.
 - 1.5.3 The DOE Office of Aviation Management will accept Contractors, on a case-by-case basis, that have been approved by the Department of Defense (DOD) and/or other Executive Agencies. Requests for this alternate acceptance method must be made through BPA Aircraft Services.
 - 1.5.4 Some sUAS operators can be considered non-CAS operators (those operators that have been contracted to provide a deliverable to BPA and the means by which they chose to provide that deliverable is not reasonably determined to require a sUAS). For example, an excavator providing weekly progress calculations using a sUAS and software processing instead of a measuring tape and theodolite. These types of operations do not have to meet the vetting and quarterly reporting requirements of this section.
- 1.6 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 will be used for the weight and balance calculations.
- 1.7 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.

- 1.8 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).

1.8.1 The report must include:

- 1.8.1.1 Agreement Start date;
- 1.8.1.2 Agreement End Date;
- 1.8.1.3 Aircraft Manufacturer;
- 1.8.1.4 Aircraft Model;
- 1.8.1.5 Vendor Name;
- 1.8.1.6 Vendor Location;
- 1.8.1.7 Registration #;
- 1.8.1.8 Costs. Flight Hours;
- 1.8.1.9 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 by either the Contractor or their Subcontractor.

- 1.9 Contractors that operate under 14 CFR Part 135 will comply with the Pilot Records Improvement Act of 1996 (PRIA) and will 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.

- 1.10 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 the CAS Vendor must perform the following prior to flight. For sUAS operations see the sUAS Section of this chapter:

- 1.10.1 Contact Dittmer Dispatch at 360-418-2281 or 800-392-0816;
- 1.10.2 Provide the company name and aircraft registration number;
- 1.10.3 Purpose of flight (Transportation, aerial survey, power line patrol, etc.);
- 1.10.4 Departure location with estimated time of departure;
- 1.10.5 Destination.
- 1.10.6 Route of flight or name of power line (e.g. John Day – Grizzly #1 500 kV line);
- 1.10.7 Estimated time of arrival or completion of work;
- 1.10.8 Provide Contractor contact's name and phone number (must be available at all times during aircraft usage);

- 1.10.9 These requirements do not relieve the Contractor from their responsibility to adhere to the vendor's flight locating procedures.
- 1.11 Upon completion of flight:
 - 1.11.1 Contact Dittmer Dispatch at 360-418-2281 or 800-392-0816;
 - 1.11.2 Notify Dispatch that air operations are complete;
- 1.12 The Contractor should have implemented an Integrated Safety Management System, which is subject to review by Bonneville Aircraft Services;
- 1.13 The Contractor will 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;
- 1.14 Aircraft equipped with position tracking devices will have the device functional during the times they are working for Bonneville, or on Bonneville property.

2. Airplane Services (Non-Transportation):

- 2.1 Airplane(s) supporting BPA construction or maintenance activities may be used for any of the following: aerial surveys, Light Detection and Ranging (LiDAR) data acquisition, and aerial photography. The personnel transported during these airplane operations must be essential to or directly associated with the aircraft operation.
- 2.2 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.
- 2.3 Aircraft Maintenance Programs:
 - 2.3.1 The Contractor must provide aircraft that have completed an annual inspection and been approved for return to service in accordance with 14 CFR Part 43, and the manufacturers approved inspection program or an FAA accepted/approved alternative method of inspection (e.g. AAIP);
 - 2.3.2 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
 - 2.3.3 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;
 - 2.3.4 Must follow Instructions for Continued Airworthiness for additional equipment and modifications to the aircraft;
 - 2.3.5 Must comply with all applicable Airworthiness Directives to the make and model of aircraft and engines, and propellers.

- 2.4 A flight and duty hours schedule meeting the following minimum requirements:
 - 2.4.1 Maximum flight time while performing aerial surveys will be limited to 8 hours in each 24 hour period; except that an exceedance of 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;
 - 2.4.2 Each pilot will be provided one rest day 24 hours in every 7 day period or two rest days will be provided in every 14 day period;
 - 2.4.3 The pilot must have 10 hours of uninterrupted rest prior to initiating flight operations each workday while operating for BPA.
- 2.5 No vendor will operate an airplane, except when necessary for takeoff or landing, below the following altitudes:
 - 2.5.1 Anywhere: Any altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface;
 - 2.5.2 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;
 - 2.5.3 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.
- 2.6 All CAS vendor airplane pilots must meet the following minimum qualifications:
 - 2.6.1 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;
 - 2.6.2 Possess a current FAA Class I or II Medical Certificate;
 - 2.6.3 Assigned as pilot-in-command under the Contractor's training program;
 - 2.6.4 Qualified and current under the Contractor's training program;
 - 2.6.5 Meets the proficiency requirements of FAA Regulations Part 61 and 91;
 - 2.6.6 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;
 - 2.6.7 Must be knowledgeable and familiar with guidance and hazards identified in the Helicopter Association International's Utilities, Patrol and Construction Guide, Chapters 1 – 7;
 - 2.6.8 Must have completed the CAS vendors FAA, International aviation authority equivalent approved initial, recurrent, or qualification-training program in the previous 12 months.

3. Helicopter Services – (Non-Transportation) General Requirements:

- 3.1 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.
- 3.2 Class B Human External Cargo (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.
- 3.3 All CAS vendor helicopter pilots must meet the following minimum qualifications:
 - 3.3.1 Possess a current FAA Airline Transport Pilot or Commercial Pilot Certificate with a Rotorcraft/Helicopter Rating;
 - 3.3.2 Possess a current FAA Class I or II Medical Certificate.
 - 3.3.3 Assigned as pilot-in-command under the Contractor's FAA Regulations Part 91, 133 and/or 135 programs;
 - 3.3.4 Qualified and current under the Contractor's FAA Regulations Part 133 and/or 135 programs;
 - 3.3.5 Meets the proficiency requirements of FAA Regulations Part 61, 133 and/or 135;
 - 3.3.6 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;
 - 3.3.7 Must be knowledgeable and familiar with guidance and hazards identified in the Helicopter Association International's Utilities, Patrol and Construction Guide, Chapters 1 – 7;
 - 3.3.8 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;
 - 3.3.9 Must have completed the CAS vendors initial, recurrent or qualification-training program in the previous 12 months;
 - 3.3.10 Completed a "flying in the wire" environment training course within the preceding 24 months.
- 3.4 Helicopter Maintenance Programs
 - 3.4.1 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
 - 3.4.2 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;

- 3.4.3 Must follow Instructions for Continued Airworthiness for additional equipment and modifications to the aircraft;
- 3.4.4 Must comply with all applicable Airworthiness Directives to the make and model of aircraft and engines, and propellers;
- 3.4.5 All maintenance must be recorded and been approved for return to service in accordance with 14 CFR Part 43 or the Contractor's FAA Approved Aircraft Inspection Program.
- 3.5 No vendor will operate a helicopter, except when necessary for takeoff or landing, below the following altitudes:
 - 3.5.1 Anywhere: Any altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface;
 - 3.5.2 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.
- 3.6 A minimum ceiling and visibility will be established by the Contractor prior to initiating work that ensures safety during operations.
- 3.7 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.

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

- 4.1 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.
- 4.2 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.
- 4.3 A flight and duty hours schedule meeting the following minimum requirements:
 - 4.3.1 Maximum flight time while performing aerial surveys will be limited to 8 hours in each 24 hour period; except an exceedance of 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;
 - 4.3.2 Each pilot will be provided one rest day in every 7 day period or two rest days will be provided in every 14 day period;
 - 4.3.3 The pilot must have 10 hours of uninterrupted rest prior to initiating flight operations each workday while operating for BPA.

5. Helicopter Services – Construction/Repair External Load Work (14 CFR Part 133):

- 5.1 Helicopters 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.
- 5.2 All rotorcraft external load operations must use a FAA approved load attachment means and the load carrying devices must meet industry standards.
- 5.3 All CAS vendor helicopter pilots must meet the following minimum qualifications in addition to those in Section 6.3, above:
 - 5.3.1 Must have 200 documented hours or more of vertical reference long line experience;
 - 5.3.2 Have received briefings or training on induced voltage hazards and other electrical hazards when working in a high voltage environment. The Contractor will provide to CAS for their review, upon request.
- 5.4 When helicopters are used to land tower sections or poles or cross arms, the following will apply:
 - 5.4.1 When landing a tower section load in an elevated position, a positive guide and positioning system will be used. Fabricated temporary load carrying devices must be designed and stamped by a Professional Engineer and will 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;
 - 5.4.2 Qualified workers may work under a hovering helicopter only to guide and temporarily secure loads, and to attach or disengage load lines;
 - 5.4.3 Loads will not be released until all tower legs, pole or cross arms are secured. Line workers will not belt off to unsecured tower sections or cross arms, and will not climb on to unsecured tower sections, pole, or cross arms;
 - 5.4.4 A maximum wind speed will 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 will be monitored and helicopter external load operations will cease when this limit is reached.
- 5.5 When performing external load work, the Contractor will submit for review by BPA's Aircraft Services at least 10 business days in advance of any proposed flight operations:
 - 5.5.1 A job specific JHA that will 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 will 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;
 - 5.5.2 When a congested area plan is required by FAR 133 the Contractor will be responsible for preparation and submittal for approval to the FAA in advance of the lift. A copy will be available to BPA Aircraft Services at their request.
 - 5.5.3 A flight duty hours schedule meeting the following minimum requirements:

- 5.5.3.1 Maximum flight time while performing external load work will be limited to 6 hours in each 24 hour period for single pilot operations and 8 hours in each 24 hour period for aircraft requiring two pilots; except that a maximum of 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;
 - 5.5.3.2 Each pilot will be provided one rest day in every 7 day period or two rest days will be provided in every 14 day period;
 - 5.5.3.3 The pilot must have 10 hours of uninterrupted rest prior to initiating flight operations each workday while operating for BPA.
- 5.6 When performing any Class C external load operations, including sock line pulls, the CAS vendor will ensure that:
 - 5.6.1 All puller-tensioners used for pulling line with a helicopter will be used in the free-wheel mode only and will have a braking system adequate to achieve tension necessary to maintain needed control of the line.
 - 5.6.2 If a breakaway device is used in conjunction with a helicopter line pull, the CAS vendor will ensure that:
 - 5.6.2.1 All personnel remain in the clear to protect them from any hazard in the event of an inadvertent breakaway;
 - 5.6.2.2 The breakaway device is inspected before each pull. If damage is suspected the shear-pin must be replaced;
 - 5.6.2.3 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:
 - 5.6.2.3.1 150 pounds indicated on the aircraft's fuel gauge, as viewed in level flight, OR
 - 5.6.2.3.2 No less than 250 pounds (approximately 36 gallons) in the fuel tanks of the aircraft.
- 5.7 When performing any Class B external load operations, the CAS vendor will ensure that:
 - 5.7.1 All long lines are non-conductive material and provide for an adequate clearance of 20 feet minimum from any infrastructure including towers, conductors, overhead ground wires or terrain features such as trees) for the operation being conducted.
 - 5.7.2 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.

6. Helicopter Services – Heli-Saw Operations:

- 6.1 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.
- 6.2 Comply with all applicable industry consensus safety standards relating to tree and brush cutting, pruning and trimming in proximity to energized high voltage lines.
- 6.3 All CAS vendor helicopter pilots conducting Heli-saw Operations must meet the following minimum qualifications in addition to those in Section 5.6:
 - 6.3.1 Must have 200 hours or more of vertical reference long line experience;
 - 6.3.2 Pilot-in-command must have 50 hours or more of aerial tree trimming experience with the make and model of aerial saw and helicopter within the previous 12 months.
- 6.4 Must have completed the CAS vendors FAA Regulations Part 133 initial, recurrent or qualification-training program in the previous 12 months.
- 6.5 A maximum wind speed will 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 will be monitored and helicopter-lifting operations will cease when this limit is reached.
- 6.6 When performing external load work, the Contractor will submit for review by BPA's Aircraft Services at least 10 business days in advance of any proposed flight operations:
 - 6.6.1 A job specific JHA that will 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 will 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 – Vegetation Management Job Hazard Analysis Submittal Instructions);
 - 6.6.2 When a congested area plan is required by FAR 133 the Contractor will be responsible for preparation and submittal for approval to the FAA in advance of the lift. A copy will be available to BPA's Aircraft Services Manager at their request.
 - 6.6.3 A flight and duty hours schedule meeting the following minimum requirements:
 - 6.6.3.1 Maximum flight time while performing aerial tree trimming external load work will be limited to 4 hours in each 24 hour period; except that a maximum of 6 hours flight time may be allowed by permission of the pilot and BPA Aircraft Services Manager to complete a specific mission;
 - 6.6.3.2 Maximum flight time including aerial tree trimming and ferry time is 8 flight hours in any 24 hour period;
 - 6.6.3.3 Each pilot will be provided one rest day in every 7 day period or 2 rest days will be provided in every 14 day period;
 - 6.6.3.4 The pilot must have 10 hours of uninterrupted rest prior to initiating flight operations each work day while operating for BPA.

6.7 Daily Job Briefings.

- 6.7.1 The Contractor will conduct a daily job briefing each morning with safety as an integral part of the briefing. The Contractor will maintain written documentation of daily job briefings using BPA form F 6410.32e, Contract Tailgate Meeting, or an equivalent form approved by BPA. These reports will be made available to BPA upon request. Each briefing will include the following:
 - 6.7.1.1 Identify the line(s), the line voltage, and the appropriate MAD;
 - 6.7.1.2 Identify the specific work methods that will be used to prevent a violation of the MAD by Contractor personnel on this project or release;
 - 6.7.1.3 Identify the qualified personnel needed to safely complete the work;
 - 6.7.1.4 Identify if a Clearance or Hold Order will be required to safely conduct the work on each specific release or project;
 - 6.7.1.5 Identify any other hazards recognized by the Contractor after an inspection of the work area and how those hazards will be mitigated or controlled;
 - 6.7.1.6 All required PPE will be reviewed.

6.8 Communications.

- 6.8.1 The Contractor will 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.
- 6.8.2 The Contractor will 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.

6.9 Minimum Approach Distance (MAD).

- 6.9.1 The Contractor will not perform any work on energized BPA high voltage conductors or equipment and will not come within the MAD of energized lines or equipment except under the provisions of a Work Clearance.
- 6.9.2 All conductors and equipment will 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.

6.10 Minimum Approach Distance (MAD) Tables.

- 6.10.1 Refer and adhere to Table 1, MAD for vehicles and equipment.

7. Small Unmanned Aircraft Systems (sUAS) Services – Commercial Aviation Services (CAS) sUAS:

- 7.1 The Contractor will comply with all provisions and restrictions listed under CFR 14 Part 107.
- 7.2 In lieu of the mid-air mitigation prevention notification requirements identified in Section 1 of this Chapter, any SUAS, CAS, or Non-CAS (as described in Section 1 of this Chapter) operators must send a notification email to AircraftServicesUAS@bpa.gov at least 24 hours prior to conducting flight operations. The email will contain UAS FLIGHT NOTIFICATION in the subject line. The body of the email will contain; the contract name/number date(s) and time(s), or date/time range of the flight, purpose of the flight, location of the flight, company name, pilot name, and contact information in the body. All operations must remain outside of all MADs listed in this document.

CHAPTER 5 – VEGETATION MANAGEMENT

In addition to the requirements of Chapter 1, the following specific work requirements apply.

1. Daily Job Briefings:

- 1.1 The Contractor will conduct a daily job briefing each morning with safety as an integral part of the briefing. Job briefings will 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 will maintain written documentation of daily job briefings using BPA form F 6410.32e, Contract Tailgate Meeting, or an equivalent form approved by BPA. These reports will be made available to BPA upon request. Each briefing will include the following:
 - 1.1.1 Identify the line(s), the line voltage, and the appropriate MAD;
 - 1.1.2 Identify any trees or brush on each project or release that if felled, could violate the MAD. Identify specific methods or tools that will be used to determine the potential for trees to fall within the MAD;
 - 1.1.3 Identify the specific work methods that will be used to prevent a violation of the MAD by Contractor workers on this project or release;
 - 1.1.4 Identify the qualified personnel needed to safely complete the work. All work conducted where an electrical hazard exists will be performed by qualified line clearance tree trimmers (QLCTT). Trainees will work under the direct supervision of a qualified line clearance tree trimmer;
 - 1.1.5 Identify if a Clearance or Hold Order will be required to safely conduct the work on each specific release or project;
 - 1.1.6 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 QLCTT when an electrical hazard exists;
 - 1.1.7 All required PPE will be reviewed.

2. Minimum Qualifications for Contractor Workers:

- 2.1 The pruning, trimming, repairing, maintaining, removing, treating, or clearing of trees or the cutting of brush that is within the MAD of electrical lines or equipment, specified in Table 2 below, will be performed by qualified line clearance tree trimmers.
- 2.2 The Contractor will ensure and be able to document that all QLCTTs working on this project or release meet the following minimum qualifications:
 - 2.2.1 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 will include at a minimum, the safety and training requirements outlined in OSHA 1910.269(r), ANSI Z133.1, *Safety Requirements for Arboricultural Operations*, and applicable State standards;
 - 2.2.2 Have completed at least 35 hours of requisite coursework and 2 years of supervised on-the-job training. This will include at least 6 months of documented experience cutting trees in proximity to energized high voltage lines operated at 50 kV and above. Documented experience will be made available to BPA upon request;

- 2.2.3 Have documented at least 1 year experience felling trees over 40 feet in height and greater than 8 inch diameter;
- 2.2.4 Have documented experience felling trees greater than 20 inch in diameter;
- 2.2.5 Have a current First Aid/CPR/AED card;
- 2.2.6 Have fluency in the English language as well as the language(s) of Contractor workers under their supervision;
- 2.3 The Contractor will make available, upon request by the CO or authorized representative of the CO, documentation verifying worker qualifications.
- 2.4 Company Requirements:
 - 2.4.1 Recordkeeping that is current for all employees, and includes all certifications, and training classes completed;
 - 2.4.2 Company manual with printed protocol for becoming a new hire, an apprentice, and a QLCTT journeyman;
 - 2.4.3 Annual internal safety training, 4 hour minimum required;.
 - 2.4.4 Provide certificates and attestations to the BPA Contracting Officer annually, by January 1st of each year.

3. Minimum Crew Size:

- 3.1 When climbing structures, all work crews will 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.
- 3.2 When climbing any tree where any portion of the tree, work tools, or equipment can enter Zone B, a second Qualified Worker/QLCTT equipped with a second set of climbing tools will be available on the job.
- 3.3 When a qualified worker is climbing a tree and working above 12 feet in height, a second Qualified Worker equipped with a second set of climbing tools will be available on the job that is trained and knowledgeable in rescue methods.
- 3.4 When sagging from a structure (by transit or other), all crews will consist of one worker on the ground qualified in climbing rescue or one of the following:
 - 3.4.1 A ground worker with radio contact with an onsite worker qualified in climbing rescue;
 - 3.4.2 Continuous radio contact with an onsite worker qualified in climbing rescue; or
 - 3.4.3 Visual contact with another worker qualified in climbing rescue.

4. Tree Falling:

- 4.1 The safety of the Contractor's workers and the public, and the integrity of the BPA system will 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 will initially apply and the CO, COR or the onsite BPA Representative will be contacted to resolve the issue.
- 4.2 It is not acceptable to fall trees on BPA lines, equipment or structures whether they are energized or de-energized. All Zone A or B trees (See Section 5.12) will be directionally felled away from transmission lines and towers using methods appropriate to ensure the direction of fall.
- 4.3 Additional methods of mechanical control will be used to safely and positively control the direction of fall whenever:
 - 4.3.1 Lodged trees are encountered. Domino falling is not an adequate method of positive control;
 - 4.3.2 Wind or other conditions make directional falling dangerous or uncertain. Alternately, work will be temporarily suspended until conditions improve;
 - 4.3.3 Decay, rot or other weak spots are present or suspected;
 - 4.3.4 A clear falling path cannot be ensured.
- 4.4 A clear falling path will be assured or:
 - 4.4.1 The tree will be felled under the protection of a Clearance; or
 - 4.4.2 Positive control will be maintained by mechanical equipment; or
 - 4.4.3 The tree will be climbed and pieced out.
- 4.5 A safe work zone and escape path will be established before a tree is felled.
- 4.6 Sufficient hinge wood will be left to hold the tree to the stump during its fall and to guide the intended direction of fall.

5. Flammable Liquids:

- 5.1 Cutters will not carry portable containers containing flammable liquids on their person.
- 5.2 All storage, handling, and use of flammable liquids will be in accordance with NFPA 30, NFPA 30A, or other applicable standards under the supervision of a qualified person.
- 5.3 All sources of ignition will be prohibited in areas where flammable liquids are stored, handled, and processed. Suitable "NO SMOKING, MATCHES, or OPEN FLAME" signs will be posted in all such areas.

6. Communications:

- 6.1 The Contractor will 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.

7. Minimum Approach Distance (MAD):

- 7.1 The Contractor will not perform any work on energized BPA high voltage conductors or equipment and will not come within the MAD of energized lines or equipment except under the provisions of a Work Clearance. In addition to these requirements, please refer to the MAD tables and information found in Chapter 1, Section 25.
- 7.2 All conductors and equipment will 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.
- 7.3 When applying herbicide, all overspray will be considered conductive. Wind and other conditions will be taken into account to ensure that the MAD is not violated by overspray or equipment.

ATTACHMENT 1 – Vegetation Management Job Hazard Analysis Submittal Instructions

Job Hazard Analysis Submittal Instructions

Contractors Name: _____

Master Agreement Number: _____

All Contractors will consider the Job Hazards on any projects that they compete for. Once a Contractor is 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

- a. 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 will maintain written documentation of daily job briefings using BPA form F 6410.32e or an equivalent format approved by BPA. These reports will be made available to BPA upon request.

3. Incident/Injury/Near-Miss Reporting

- a. The Contractor will maintain an accurate record of, and will immediately report to the Contracting Officer Technical Representative (COR) or the onsite BPA Representative in the manner prescribed by the latter, all cases of death, injury, occupational diseases, and near hits arising from, or incident to, performance of work under this contract.
- b. For incidents that involve personal injury, illness, or property damage the Contractor will complete and file with the BPA Safety Organization through the COR, or onsite BPA Representative, BPA Form F 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 will complete and file with the BPA Organization through the COR, or onsite BPA Representative, BPA form F 6410.18e, *Contractor's Report of Incident/Near-Miss*, within 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) will wear red hard hats. All other workers will wear white hard hats.

5. Use of Proper Fall Protection

- a. List fall protection measures appropriate for work being performed.

6. Environmental Issues

- a. Snake bites, bees, poison oak, heat stress, cold weather.

7. Chainsaw Safety

- a. 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 MAD tables – Table 2 for QLCTT, Table G 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 QLCTTs 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 (CORs), onsite BPA Representative, and BPA Transmission Line Maintenance workers. Communicating with CORs or on-site BPA Representatives is important.
- b. QLCTTs 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 (QLCTT).
- b. List the name of the QLCTTs 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

- a. The Contractor will 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 (SDSs) 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 will 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

- a. Contractors will never handle ungrounded downed conductors. The handling of downed conductor is to be accomplished **ONLY** by Qualified Electrical Employees 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 Employee, the Contractor will not handle the downed conductors.

20. Electrical Contact Protocol

- a. Any worker experiencing an electrical shock of any type will be transported to the nearest emergency medical facility as soon as possible.
- b. In case of electrical shock, the worker is advised to contact one of the Electrical Burn Centers that specialize in electrical shock accidents.
- c. There are three Electrical Burn Centers serving BPA's service territory.
 - i. Emanuel (Portland) covers all of Oregon and north to the Kelso/Longview, Washington area.
 - ii. Harborview (Seattle) covers the rest of Washington and into northern Idaho and western Montana.
 - iii. Intermountain (Salt Lake City) covers southern Idaho.
- d. The operative standard is to have a maximum of 3
- e. hours of air travel time to the nearest burn unit. All three work cooperatively.
 - i. Legacy Emanuel Medical Center (Portland, Oregon) – (888) 598-4232
 - ii. Harborview Medical Center (Seattle, Washington) - (888) 731-4791
 - iii. Intermountain Burn Center - University of UT (Salt Lake City, Utah) - (801) 581-2700

ATTACHMENT 2 – Minimum Approach Distance (MAD) Charts and Tables

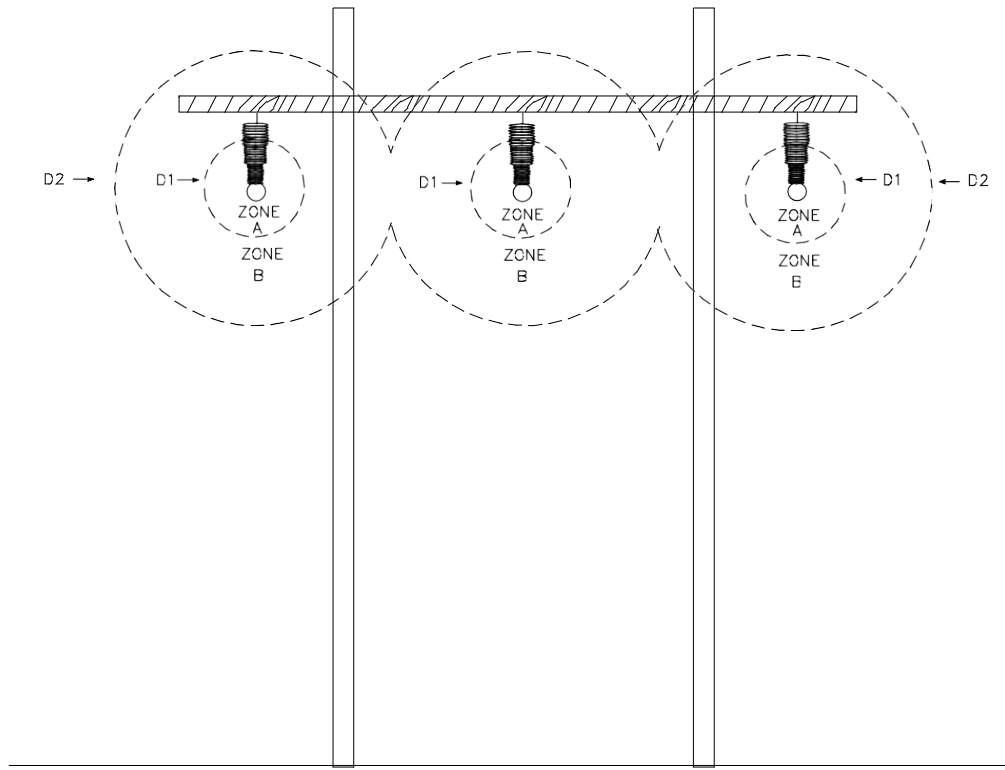


Figure 1 - Minimum Approach Distances (MAD) from Energized Conductors

D1 (distance 1): MAD for Qualified Line-Clearance Tree Trimmer (see Table 2 above)
D2 (distance 2): MAD for all other tree workers (see Table G above)

Zone A – Inside the MAD. Any trees or work completed in this zone requires an outage (Clearance), and the workers will be QLCTTs or under the direct supervision of QLCTTs.

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 will be QLCTTs. A Hold Order may be required for work in this zone (see note below).

Note: 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.

Table 10 – Minimum Approach Distance (MAD) from Energized Conductors for Qualified Line Clearance Tree Trimmers

Table 2 - MAD from Energized Conductors for Qualified Line Clearance Tree Trimmers	
Nominal Voltage (Phase-to-Phase)	Phase-to-Ground (ft-in)
51 – 300 V	Avoid Contact
301 – 5k 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: MADs 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	