

Electrical Work Safety

1.0 Purpose

The purpose of this procedure is to define the requirements for electrical safety and to ensure compliance with National Fire Protection Association (NFPA) 70E, Standard for Electrical Safety Requirements for Employee Workplaces; U.S. Department of Energy (DOE); Occupational Safety and Health Administration (OSHA); and Washington Industrial Safety and Health Act (WISHA) requirements. The provisions of this procedure apply to subcontractors or vendors who perform work on or near exposed energized electrical equipment for Battelle-Pacific Northwest Division (PNWD).

2.0 Definitions

De-Energized: Equipment or systems where electrical or mechanical energy has been released by disconnecting power, discharging all capacitors, short-circuiting and grounding all high-capacitance elements, releasing or physically restraining springs, and relieving or blocking all other sources of stored energy. De-energizing is considered a potentially hazardous task.

Diagnostics and Testing: Diagnostic and testing includes work performed on or near live parts related to tasks such as electrical testing, troubleshooting, or voltage and current measurement. It may require the use of portable test instruments, but no other tools can be used on energized parts. **Note:** Repairing, replacing, or removing energized exposed components is considered energized work, not diagnostic and testing.

Electrical Hazard: A dangerous condition in which inadvertent or unintentional contact or equipment failure can result in shock, arc flash burn, thermal burn, or blast.

Electrical Installation: Work that involves installing power circuits, installing permanent wiring, attaching new electrical equipment to a facility's permanent electrical wiring, or modifying electrical equipment that is attached to a facility's permanent wiring (i.e., situations where a modification permit is needed). It does not include installing cord and plug connected equipment.

Energized: Equipment or systems electrically connected to an energy source. All electrical equipment is considered to be energized until proven otherwise (using a meter).

Qualified Electrical Worker: A person who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training on the hazards involved. Such a person is familiar with the proper use of precautionary techniques, personal protective equipment, insulating and shielding materials, insulated tools, and test equipment. A person may be considered qualified with respect to a certain equipment but still be unqualified for others.

3.0 Requirements

The electrical work safety procedure addresses:

- Training

- Underground Temporary Electrical Components
- Boundaries
- Shock Analysis
- Flash Hazard Analysis
- Working On or Near Exposed Energized Electrical Parts within the Limited Approach Boundary
- Working On or Near Exposed Energized Electrical Parts within the Restricted and Prohibited Approach Boundary
- Energized Electrical Work Permit Process
- Testing and Troubleshooting on Live, Energized Parts
- De-energizing Live Parts
- Clothing
- Nonconductive Equipment Protection
- Electrical Testing
- Ground Fault Circuit Interrupter (GFCI) Protection and Testing
- Blind Penetrations
- Stopping Work
- National Electrical Code Compliance
- Work Affecting Electrical Utilities Operations
- Flash Protection
- Equipment
- Flexible Cords and Cables
- Specific Activities/Requirements.

Training

Non-PNWD staff receive basic instruction on electrical safety as part of their orientation; this instruction is covered in the PNWD Laboratory Orientation (Course 1450) when work is performed on PNWD sites.

Non-PNWD staff who face a higher-than-normal risk of contact with electrically energized parts (e.g., technicians, vendors, craftsmen, etc.) must be trained to understand electrical hazards associated with work related activities in accordance with NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces, requirements.

Note: Such persons shall also be familiar with PNWD procedural requirements, emergency procedures, personal protection equipment (PPE), arc flash, test equipment, insulating materials and tools. A person can be considered qualified with respect to certain equipment and methods, but still be unqualified for others.

Electrical qualification is documented using the Subcontractor Electrical Worker Qualification Form.

Underground Temporary Electrical Components

Temporary electrical components placed underground are marked so that identification and approximate location is readily apparent aboveground.

Boundaries

Limited Approach Boundary – Working Near (refer to Table 1): This boundary establishes the distance around exposed energized parts that only a qualified person may enter. If an unqualified person must enter the limited approach space to perform a minor task, like inspection, then a qualified person must advise them of the possible hazards and ensure that the unqualified person is under the direct supervision of a qualified person.

To enter limited spaces, the qualified person must:

- Perform shock hazard analysis and flash hazard analysis to which personnel will be exposed.
- Obtain and adhere to a PNWD-approved EEWP.
- Have specific knowledge of equipment.

Restricted Approach Boundary (refer to Table 1): This boundary establishes the distance around exposed, energized parts that only a qualified person may enter. To enter the restricted approach boundary, the qualified person must:

- Perform shock hazard analysis and flash hazard analysis to which personnel will be exposed.
- Obtain and adhere to a PNWD-approved EEWP.
- Have specific knowledge of equipment.

Prohibited Approach Boundary (refer to Table 1): Crossing or entering the prohibited boundary is considered the same as making contact with exposed energized parts. The following tasks are considered energized work: performing safe-work checks in support of lockout and tagout, testing or troubleshooting of energized conductors, or working on exposed, energized conductors or circuit parts. This includes crossing the boundary with hands, feet, other body parts, probes, tools, or test equipment regardless of protective clothing.

To enter the prohibited boundary, the qualified person must:

- Perform shock hazard analysis and flash hazard analysis to which personnel will be exposed.
- Obtain and adhere to a PNWD-approved EEWP.
- Have specific knowledge of equipment.

Note: Whenever possible, all equipment and circuits to be worked on or near shall be de-energized before work is started and personnel protected by lockout and tagout.

Table 1. Approach Boundaries to Live Parts

Nominal System Voltage Range	Limited Approach Boundary		Restricted Approach (includes inadvertent movement adder)	Prohibited Approach Boundary
	Exposed Movable Conductors	Exposed Fixed Circuit Parts		
51 to 300 V	10 ft 0 in.	3 ft 6in.	AVOID CONTACT	AVOID CONTACT
301 V to 750 V	10 ft 0 in.	3 ft 6 in.	1 ft 0 in.	1 in.
Over 751 V, not over 15kV	10 ft 0 in.	5 ft 0 in.	2 ft 2 in.	7 in.
15.1 kV to 36 kV	10 ft 0 in.	6 ft 0 in.	2 ft 7 in.	10 in.
36.1 kV to 46 kV	10 ft 0 in.	8 ft 0 in.	2 ft 9 in.	1 ft 5 in.

Shock Analysis

A shock hazard analysis shall determine the voltage to which personnel will be exposed, boundary requirements, and the PPE necessary in order to minimize the possibility of electric shock to personnel.

Flash Hazard Analysis

An electrical arc flash analysis shall be conducted in order to protect personnel from the possibility of being injured by an arc flash. The analysis shall determine the flash protection boundary and the personal protective equipment that people within the flash protection boundary must wear.

Note: If the flash analysis determines the incident energy to be 40 cal/cm^2 , the work must not be performed unless an electrical safe work condition has been established.

Note: For AC systems, see the Flash Protection Boundary and Arc Incident Energy Calculator (Excel) or contact Construction Safety for assistance.

Note: If you are unable to calculate the flash protection boundary, assume a 4-foot flash protection boundary based on 0.1 seconds clearing time and the available bolted fault current of 50 kA.

Note: NFPA 70E Table 130(C)(9)(a) can be used in lieu of the flash hazard analysis to determine the hazard/risk category for the electrical task. For tasks not listed, or power systems with greater than the assumed short circuit current capacity of 50 kA or with longer clearing than assumed fault clearing time of 0.1 seconds, a flash hazard analysis shall be required.

Working On or Near Exposed Energized Electrical Parts within the Limited Approach Boundary

Qualified electrical workers, PNWD EEWP author, and PNWD electrical safety engineer or delegate will determine the electrical hazards during site visit.

Since each job may differ in electrical hazards, PPE also varies according to the incident energy levels. PPE may include fire retardant clothing, an arc flash face shield, insulated gloves with leather protectors, insulated tools, voltage-rated rubber blankets, or insulated shielding.

Before conducting work, follow these safety practices:

- Provide suitable working clearance for the equipment (i.e., 36 inches in front of equipment, 30 inches wide, and 6 feet high).
- Locate the disconnect to de-energize equipment before starting work.
- Confirm that lighting is adequate.
- Do not reach blindly into areas that might contain exposed live parts where an electrical hazard exists.
- Secure doors and hinged panels to prevent swinging into the worker.
- Restrict access with barricades, or attendants to isolate the work area and warn others of the exposed energized electrical circuits.

Verify that the prejob safety documentation is consistent with the scope of work. Use signs (designed in accordance with NFPA 70E) to isolate the work area and warn others of the exposed energized electrical circuits. Electrical safety warning signs are worded:

DANGER – ELECTRICAL HAZARDS –

AUTHORIZED PERSONNEL ONLY

Before starting, a PNWD Electrical Qualified Worker conducts a prejob safety briefing for participants involved with the work to be performed. The prejob meeting shall be documented using the Prejob Safety Planning Signoff Sheet. The PNWD Electrical Qualified Worker gives the briefing again for the oncoming shift workers if the job continues through a shift change. Use insulated tools suitable for the voltages where the tools or equipment might make accidental contact with exposed energized parts. If you receive any electrical shock (other than static), stop work and report to the immediate supervisor and the nearest first-aid facility.

Working On or Near Exposed Energized Electrical Parts within the Restricted and Prohibited Approach Boundary

In addition to the requirements in safe practices for work within the limited space found above, qualified electrical workers, PNWD EEWP author, and PNWD electrical safety engineer or delegate will determine the electrical hazards during site visit.

Since each job may differ in electrical hazards, PPE also varies according to the incident energy levels. PPE may include fire retardant clothing, an arc flash face shield, insulated gloves, insulated tools, voltage-rated rubber blankets, or insulated protective barriers. Do not wear or carry any conductive accessories (such as rings, watches bracelets, metal frame glasses, or metal hats) in clothing pockets where they may make contact with exposed, energized parts. Clothing made of flammable materials such as acetate, nylon, polyester, polypropylene, and spandex shall not be worn. When the two-person rule is required for work on energized components, this person observes the worker to ensure that clearances are maintained and performs electrical emergency rescue if required. The backup person must be cardiopulmonary resuscitation (CPR) certified and trained in first aid. The two-person rule is required for any de-energizing, diagnostic and testing, or energized work on systems rated >240 volts.

Energized Electrical Work Permit Process

An Energized Electrical Work Permit (EEWP) is required when working within the limited, restricted, and prohibited space of exposed energized parts. Working on energized parts must be considered a last resort after all other opportunities for establishing an electrically safe work condition have been exhausted. After consulting with electrical qualified workers and PNWD Electrical Safety Engineer or delegate (e.g., PNWD S&H Representatives) ensure that measures have been taken to de-energize all electrical sources and that there is no feasible alternative to completing work on the energized equipment that is within the approach boundaries. The compelling reason for justifying energized work shall be identified on the EEWP.

- EEWPs associated with construction activities will utilize EEWP form in. All other contractor activities will be provided a hardcopy of an electronic EEWP.
- Standardized EEWPs may be developed for routine tasks and must be re-approved every 6 months.
- Nonstandard EEWPs must be re-approved every 30 days.
- Include the completed permit with other pre-job safety planning documents.
- Have a copy of the completed permit available at the jobsite.

Note: Examples of when de-energizing is not required are:

- Increased or additional hazards, such as interruptions of life support systems, shutdown of hazardous location ventilation equipment, or deactivation of emergency alarms.
- Infeasibility due to equipment design or operational limitations that include:
 - Testing of electric circuits that can only be performed with the circuit energized.
 - Work on one circuit which would require a complete shutdown of a continuous process.

Testing and Troubleshooting on Live, Energized Parts

Testing and troubleshooting on live, energized parts is allowed when an EEWP for troubleshooting is developed and approved. If a problem is discovered during the troubleshooting and either a component must be removed or rework must be performed, this is no longer troubleshooting. At that time, the circuit must be de-energized and locked out in accordance with the PNWD Lockout/Tagout Program. Another EEWP must be developed and approved before the work can be started if de-energizing is not feasible.

Note: While troubleshooting, work may continue under the original “troubleshooting” permit. However, this original “troubleshooting” permit is not valid for any rework or component removal.

Note: Removing or installing a fuse from a circuit above 50 volts to ground requires de-energizing the fuse terminals unless doing so creates increased hazards or is infeasible due to equipment design. Use fuse-handling equipment, insulated for the circuit voltage, to remove or install fuses when one or both terminals are energized.

De-energizing Live Parts

Electrical parts in the medium or high-risk category (see Table 2) are de-energized and locked and tagged out to the maximum extent feasible before they are maintained, repaired, or parts are exposed within the limited approach boundary. Refer to the PNWD Lockout/Tagout Program for further guidance.

Table 2. Risk Categories for Electrical Parts

Risk Category	Voltage/Capacity Values (voltage is line-to-ground or line-to-line, whichever is greater)
Medium	<50 V and >1000 W, <10 J stored energy in a capacitor or 50 to 240 V and >5 mA, <10 J stored energy in a capacitor.
High	>240 V and >5 mA or >10 J stored energy in a capacitor.

If de-energized, but not locked and tagged-out, treat parts as live—except equipment with a cord and plug that is under the direct and exclusive control of the qualified person performing the work.

Note: Energized parts that are considered minimal risk need not be de-energized if there is no increased exposure to electrical burns or to explosion due to electric arcs.

The criteria for minimal risk include the following:

- <50 V and <1000 W, <10 J stored energy in a capacitor
or
- >50 V and <5 mA, <10 J stored energy in a capacitor
or
- a single battery or battery systems at <50 V and <10 kWh storage capacity.

Note: If de-energizing requires lifting or cutting neutrals or grounding electrode conductors, perform the following:

- Treat all disconnected/cut neutrals and grounding electrode conductors in the affected circuit as energized until zero energy is verified and any lifted, cut, or otherwise disconnected neutrals and grounding electrode conductors are insulated (i.e., wire nut, electrical tape, or other approved insulating material is installed). Note that some grounding electrode conductors are bare. They cannot be insulated, but must be treated as energized until zero energy is verified. Wear PPE as required in this section while performing zero energy checks and establishing safe work conditions (i.e., insulating cut/disconnected neutrals).
- PPE is required when removing and reconnecting these wires due to the potential for changing electrical conditions in previously de-energized circuits via ungrounded or shared neutrals. PPE for this task can be downgraded to shock protection only if an arc flash analysis has been conducted.

Clothing

When a non-PNWD staff is working within the flash protection boundary, he/she shall wear protective clothing and other protective equipment. Clothing selection is based on the arc incident energy level. Non-PNWD staff may be required to wear protective equipment for the head, face, neck, chin, hands, and arms whenever there is exposure to electric arcs or flashes. Inspect fire retardant clothing and apparel before each use. Fire retardant clothing found to be damaged or contaminated with grease, oil, shall not be used. Follow manufacturer's instructions for care and maintenance.

Non-PNWD staff are trained to the manufacturer's instructions, characteristics, and PPE ratings. Document PPE training received by using the training attendance record or an equivalent form.

Nonconductive Equipment Protection

Store and use equipment according to the manufacturer's recommendation. A qualified worker will inspect item(s) to be used before each use to verify the item is in satisfactory condition and has been tested as required. Inspect gloves for holes by air testing before use.

Note: Rubber protective equipment is inspected, cleaned, and tested at 6-month intervals. Hot sticks are tested at least every 12 months and date stamped at that time. A recommended alternative is to use disposable, voltage-rated (not to exceed 1000 volts) protective equipment.

Inspect voltage-rated tools for defects and surface contamination such as moisture before each use. Do not rely on insulated tools alone for complete protection.

Non-PNWD staff are briefed on the use of insulating rubber gloves. The Checklist for Insulating Rubber Gloves exhibit provides a checklist for users of insulating rubber gloves, as well as a basic outline for initial briefings and on-the-job-training.

Electrical Testing

Only qualified personnel, who are trained on the operation and limitation of the equipment, shall use electrical test equipment. Verify test equipment have been tested and certified by an independent testing laboratory such as Underwriter's Laboratory (UL) in the United States or Canadian Standards Association (CSA) in Canada. Visually inspect electrical test equipment before use for broken case, worn test leads, frayed or broken wires. Also check for 600 volt or 1000 volt CAT III or CAT IV rating. Identify defective test equipment by tagging it out of service, and repair or dispose of it properly. Use electrical test equipment only for intended applications. Make operating instructions and limitations for the test equipment available to the electrical worker. Check electrical test equipment for proper operation immediately before and after use when verifying that circuits are placed in an electrically safe work condition. When performing zero-energy checks, make sure that stored electrical or mechanical energy cannot re-energize the circuit.

Ground Fault Circuit Interrupter (GFCI) Protection

Use GFCIs on 120-volt circuits as specified below:

- in damp or wet (standing water) work areas

- outdoors
- for temporary power (e.g., extension cords) during construction, remodeling, maintenance, repair or similar activities
- when using portable, electric hand tools with cord/plug connectors.

Ground Fault Circuit Interrupter (GFCI) Testing

Test GFCI breakers at least monthly per manufacturer's instructions. Users test portable GFCIs using the test button provided before each use.

If the GFCI breaker fails the test, tag out of service with a "DANGER — DO NOT USE" tag and (if portable) remove from service.

Tripped circuit breakers may not be re-energized until it has been determined that the equipment and circuit can be safely re-energized.

Do not reset or operate facility circuit breakers; contact the building manager or delegate.

Flexible Cords and Cables

Use UL-listed flexible cords suitable for conditions of and location of use. Flexible cord sets used with grounding-type equipment contain an equipment grounding conductor.

Protect flexible cords and cables from damage. Extension cord sets are not to be used as a substitute for the permanent wiring of a building.

Note: Cords and cables may be damaged by foot traffic, vehicles, sharp edges, pinching, or improper storage.

Note: Extension cords are an acceptable means of extending power provided they do not contribute to overload, are protected from damage, and are removed when not in use.

Discard damaged cord sets. Cord sets that have breaks in the insulation repaired by a qualified person so that the insulation is equal to, or better than, the original. Do not repair cords smaller than number 12 American Wire Gage.

Blind Penetrations

Entering a Space

- Do not reach blindly into areas that may contain energized parts.
- Do not enter a space or perform functions such as connecting or disconnecting cords, actuating circuit breakers or switches, or any other operation that may require being close to exposed energized parts if lighting is not adequate or an obstruction prevents adequate observation of the work.

Class I Penetrations (penetrations into hollow walls, ceiling, or floors where the absence of utilities or other hazards has been determined, or 2 inches or less into).

- Managers assigning workers to perform Class I penetrations must consider the location and type of work to be performed and provide oversight as necessary.
- Workers performing Class I penetrations must evaluate the location of intended penetrations to identify potential hazards due to presence of hidden utilities (e.g., electrical, gas, steam) or hazardous materials (i.e., potential asbestos-containing materials). The worker evaluates the hazards with assistance, if needed, by examining the material to be penetrated and checking behind walls, under floors, or above false ceilings to attempt to locate hidden utilities or other hazards that could be contacted during the penetration.

Upon completion of the evaluation, workers must implement the following controls:

- Use existing penetrations/holes when possible.
- Use self-tapping nylon wall anchors where appropriate for the application (e.g., anchoring light loads on sheetrock walls).
- Use non-conductive manual tools (e.g., star drills, screwdrivers, wooden handle punches, or similar tools with non-conductive handles) when feasible to make penetrations.
- Limit depth of penetration to the thickness of the external surface of hollow cavities or no more than 2 inches into solid materials when using power tools by use of short drill bit, depth gage, or other means. **Exception:** Use of self-tapping nylon wall anchors is exempt from this requirement.
- Use tools equipped with a GFCI or a battery-powered tool where electric power tools are needed. Test GFCIs before use.
- Visually inspect or probe (tools with nonconductive handles) completed penetrations before inserting screws, toggle bolts, etc. that might contact hazards.
- Scanning is not required for penetrations of less than 2 inches in solid materials. However, regardless of depth, electric power tools are required to be protected by grounded metal contact/power cut-off circuitry (“white box” attachment or integral circuitry).
- Minimum PPE required for Class I penetration: Safety glasses with side shield, leather gloves, and substantial footwear.
 - Wear rubber outer boots over foot protection when using electric cord connected power tools with water coolant or in a wet environment.
 - Wear Class 00, 500-volt rated insulated gloves and leather protectors when penetrating solid materials (does not apply to hollow structures).

Note: When a hollow cavity must be penetrated beyond the thickness of the exterior surface, a check for hazards (e.g., utilities, asbestos) must be made after penetration of the outside surface by looking into the hole with a flashlight, boroscope, or probing with a nonconductive or insulated tool such as a screwdriver or wooden handle punch. Stop work and notify your supervisor if this check reveals potential asbestos-containing materials. Take steps as necessary to move or remove fiberglass insulation or other non-hazardous materials that may obscure hazards. The absence of hazards in the area to be penetrated must be verified before proceeding. **Exception:** Use of nylon wall anchors is exempt from this requirement.

- A Class II Penetration Permit is required when penetrating solid materials beyond a depth of 2 inches or in hollow structures where the absence of utilities or other hazards cannot be determined as described in the note above.

Stopping Work

If any unusual conditions are encountered while performing a penetration, the operation must be stopped and the responsible manager/delegate must be informed.

Note: Examples of unusual conditions are evidence of metal shavings, electrical or insulating material, or other unexpected materials; or an unusual sound such as that caused by contact of a drill bit with a metal object; lighting or other equipment unexpectedly turning off; GFCI or breaker trip.

Class II Penetrations (solid material penetrations greater than 2 inches in depth, or penetrations through hollow structures where the absence of utilities or other hazards has not been determined.)

The following steps must be followed for Class II penetrations.

- A Class II Penetration Permit must be completed for work requiring cutting, drilling, or otherwise penetrating deeper than 2 inches into solid material or through hollow structures (walls, floors, etc.) that contain, or may contain utilities or other hazards.
- For Class II penetrations, the immediate manager or delegate for staff performing the work, with assistance from knowledgeable personnel, must evaluate the hazards and document this assessment on the Class II Penetration Permit.
- Review historical records, engineering drawings, and plans that pertain to the area/location of the planned penetration.
- Consult with the PNWD construction manager, or other knowledgeable personnel, to assist in identifying potential hidden hazards.
- Visually inspect the proposed location of the penetration for evidence of hidden utilities in or behind walls, above false ceilings, and under sub-floor systems.
- Obtain a utility location with nondestructive testing devices (e.g., penetrating ionizing radiation, and ground-penetrating radar; magnetic and inductive devices) and mark the penetration point. If the responsible line manager or delegate has knowledge that a structure, wall, floor, or other surface does not contain electrical, gas, or other hazards, a Class II penetration may be authorized without a scan.
- If it is suspected that hidden hazards exist at the point of penetration, relocate the work if possible. If penetration cannot be relocated to a site free of obstructions, then de-energize and lock and tag utilities in the location of the penetration.
- If the penetration is to be made into a solid load-bearing wall or floor or if it cannot be relocated to avoid suspected reinforcing bar, consult a structural engineer prior to performing the penetration to make sure that the penetration does not unacceptably reduce load-bearing capacity of wall.
- Class II penetration permits must be reviewed and approved by the building manager/delegate, line manager responsible for staff performing the penetration, and the safety and health representative.

- Post the permit at the job site.

Workers must implement the following controls:

- Wear PPE and follow requirements specified by the Class II Penetration Permit.
- Electric power tools must be protected by grounded metal contact/power cut-off circuitry ("white box" attachment or integral circuitry). If the power tool with ground-sensing capability detects metal objects, stop work immediately and notify your manager.

Note: The work cannot be restarted until the penetration is relocated or the grounded metal object is identified by removing the concrete material. Only qualified electrical workers with appropriate PPE can expose embedded material.

- After identifying the grounded metal object, the responsible line manager/delegate determines the appropriate method to proceed.

Note: If the embedded object appears to be conduit, conductors, or presents other hazards to workers, stop work, isolate the area, warn other workers and notify PNWD construction manager. Do not proceed.

- If the material is rebar or other structural material and the penetration cannot be relocated, consult a structural engineer for approval to remove it. A smaller diameter core may be required in order for power tools with ground-sensing capability to continue operation, or multiple pilot holes may be drilled to check that additional embedded metal objects do not exist in the penetration path. Once absence of additional metallic objects has been verified, power tools with ground-sensing capability can be removed and penetration completed.

Stopping Work

- If any unusual conditions are encountered while performing a penetration, the operation must be stopped and the responsible manager/delegate must be informed.

Note: Examples of unusual conditions are evidence of metal shavings, electrical or insulating material, loss of water during core drilling, or other unexpected materials; or an unusual sound such as that caused by contact of a drill bit with a metal object; lighting or other equipment unexpectedly turning off; GFCI or breaker trip.

- In addition, work must be stopped if any of the following conditions occur before or during the penetration:
 - Penetration area boundaries have changed.
 - Additional penetration work beyond the scope of the original work is required.

National Electrical Code Compliance

Electrical installations and modifications are inspected by a qualified electrical inspector in accordance with contract requirements.

Work Affecting Electrical Utilities Operations

When work takes place within a horizontal distance 20 feet of the center line of the nearest voltage line, notify the electrical utility owner for an onsite meeting to establish conditions to safely complete the operations. If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 feet. If the voltage is higher than 50 kilovolts, increase the clearance by 0.1 meter for every 10 kilovolts over that voltage. For other reduced clearances, consult the appropriate PNWD safety and health representative.

In addition to the requirements above, notify utilities if you intend to:

- Move any equipment taller than 14 feet under overhead power lines.
- Operate equipment within 20 horizontal feet from overhead high voltage (over 600 volts) power lines. If a vehicle is in transit with its structure lowered, the clearance may be reduced to 1.22 meters.
- Perform any operations near power lines during bad weather or hazardous conditions (rain, range fires, dust or wind storms, etc.).

4.0 References

NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces

NFPA 70, National Electric Code

WAC 296-24, Part L, Electrical

29 CFR 1226, Safety and Health Regulations for Construction

29 CFR 1910, Occupational Safety and Health Standards

5.0 Forms

[Subcontractor Electrical Worker Qualification Form](#) (Word)

[Prejob Safety Planning Signoff](#) (Word)

[Electrical Energized Work Permit](#) (Word)

[Class II Penetration Permit](#) (Word)

[HESP Arc Flash Calculator](#) (Excel)

6.0 Exhibits

[Checklist for Insulating Rubber Gloves](#) (Word)