BP WIND ENERGY
POLICIES AND PROCEDURES

Grounding - Assured Grounding

Document Control Details

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1.0 Purpose/Scope

1.1 The purpose of this procedure is to outline the appropriate steps in order to verify that equipment is properly grounded.

1.2 This procedure specifies minimum requirements for the minimization of static electrical energy and should be used in conjunction with the site's Electrical Safety procedures.

1.3 This procedure applies to all operations. It is required to provide grounding for the entire electrical system, each piece of electrical equipment, machinery, extension cords, and all portable tools. Only qualified personnel may work on exposed electrical equipment.

1.0 Reference

1.1 HSSE 22.10.01 - BPWE Electrical Safety Procedure

1.2 NFPA Standards 70E - Standard for Electrical Safety in the Workplace.

1.3 OSHA 29CFR 1910.137 - Electrical Protective Devices

1.4 OSHA 29CFR 1910.333 - Selection and Use of Work Practices.

1.5 OSHA 29CFR 1910 Subpart S - Electrical.

2.0 Key Responsibilities

2.1 Site and Facility Managers are responsible for the implementation and enforcement of this policy.

2.2 Primary responsibility always falls back to the user of any such equipment to verify that grounding is properly done.

2.3 If proper grounding of the equipment in question is beyond the capabilities of the primary user, then the proper chain of authority shall be used to determine who is qualified to inspect or install the equipment in question.

3.0 Acronyms and Definitions

Acronyms Table

Acronym	Definition
AC	Alternating Current
ASTM	American Society for Testing and Materials
DC	Direct Current
GFCI	Ground Fault Circuit Interrupter
NEC	National Electric Code
PPE	Personal Protective Equipment

Grounding - Assured Grounding

Definitions Table

Term	Definition
Bonding	The process of establishing electrical continuity between two or more conductive surfaces. Additionally, it is a process of connecting two or more conductive objects together by means of a conductor to minimize potential differences between conductive objects. Bonding "equalizes" the potential between objects.
Explosive Proof	An apparatus enclosed in a case that is capable of withstanding an explosion of a gas or vapor that may occur within it and preventing the ignition of a gas or vapor surrounding the enclosure.
Grounding	A safe pathway for electricity to follow to the ground in the event of electrical leakage in circuits and/or equipment. Also, the process of connecting one or more conductive objects to the ground. Grounding dissipates an electric charge to the ground.
Intrinsically Safe	Equipment in which any spark or thermal effect is incapable of causing an ignition of a flammable or combustible material in air.
Qualified Person	One familiar with the construction and operation of the equipment and the hazards involved and are permitted to work on or near exposed energized parts.
Service Point	The point of connection between the facilities of the serving utility and the premises wiring.
Static Electricity	The electrification of materials through physical contact and separation and the various effects resulting from the positive and negative charges so formed. Static is generated when liquids move into contact with other materials, such as pouring, mixing, pumping, filtering, or agitating.
Static Spark	An impulsive discharge of electricity across a gap between two points not in contact.
Unqualified Person	One who is working in the area of equipment with exposed energized parts but is not a qualified person.

Grounding - Assured Grounding

4.0 Procedure

4.1 General Grounding

A. Personnel shall confirm that the manufacturer's grounding recommendations are followed when installing or using any electrical equipment or devices.

B. The grounding conductor shall be the first to be connected and the last to be disconnected.

4.2 Equipment Grounding

A. The grounding of equipment is primarily for personnel protection and is required for all metallic housings, enclosures, and structures which contain electric conductors.

B. Grounding shall be interconnected to the extent that a low potential difference is maintained between nearby metallic objects.

C. Equipment grounding applies to motor frames, enclosures for controls, transformer cases, transformer back fences, metallic houses, etc.

D. The National Electrical Code and National Electric Safety Code shall be referenced to verify equipment grounding requirements are met.

4.3 Lightning and Arrestor Grounding

A. Arrestors shall be connected to a low resistance ground in order to provide effective surge protection.

B. Metallic tanks and structures that are in contact with the ground shall be sufficiently grounded to provide for safe dissipation of lightning strikes.

4.4 General - Equipment Inspection, Testing, and GFCI Use

A. Personnel shall follow all energy isolation requirements before working on any electrical equipment.

B. Personnel shall verify that the manufactures grounding recommendations are followed when installing or using any electrical equipment or devices. **No one shall bypass or defeat any of these safety devices or systems**.

C. The grounding conductor shall be the first to be connected and the last to be disconnected if the grounding conductor is separate from the power conductors.

4.5 Equipment Inspection, Testing, and GFCI Usage

A. Electrical equipment shall be protected by using either Ground Fault Circuit Interrupters (GFCI) or an assured grounding conductor program. Double insulated tools are not required to be grounded or tested.

B. All permanent 120-volt single-phase receptacles with a potential to be exposed to water shall have a GFCI type or be protected by a ground fault breaker.

C. GFCIs may be of the portable, receptacle, or circuit breaker type and shall be tested periodically (not to exceed three months) to confirm its operability.

Caution: 4.5

When electrical equipment is used in potentially wet areas and connected to a circuit that does not have a GFCI incorporated, it shall be protected by a portable GFCI.

D. All electrical cord sets, portable electric hand tools, and any equipment connected by cord and plug shall be visually inspected prior to use and protected by using either ground fault circuit interrupters or an assured grounding conductor program. (Double insulated tools are not required to be grounded or tested.)

E. All 120 volt single phase receptacle outlets that are not part of the permanent wiring of the building or structure and that are in use with the referenced equipment shall have approved ground fault interrupter protection.

Note: 4.5 E

Some receptacle outlets that are part of the permanent wiring of the building may not be required to have GFCI protection. However, it is intended that they be used with portable GFCIs and meet the provisions of this section.

4.6 Assured Equipment Grounding Conductor Inspection Program

Note: 4.6

The following tests shall be performed on all cord and plug equipment used in a portable fashion or similar equipment that is moved from site to site.

A. Grounding conductors shall be tested periodically for electrical continuity. Tests shall be performed by the person responsible for maintaining the equipment as follows:

- Before first use.
- Before equipment is returned to service following any repairs.
- Before equipment is used after an incident that is suspected to have potentially caused damage to equipment, i.e., when a cord is run over.
- At intervals not to exceed three months.
- Each cord set, attachment cap, plug and receptacle of cord sets, and any equipment connected by cord and plug, except those that are fixed and not exposed to damage, shall be visually inspected before each day's use for external defects and for indication of possible internal damage, equipment found damaged or defective may not be used until repaired.
- Tests performed under the Assured grounding conductor-testing program must be documented. Test documentation shall identify each item of equipment tested and indicate the last date it was tested.
- Equipment found to be defective should not be used until repaired.
- All tests other than the visual inspection and periodic testing of the GFCI

button shall be documented and kept on file at the applicable field or plant location.

B. Tests performed under the assured grounding conductor testing program shall be documented and kept on file at the applicable field or plant location. Test documentation shall identify each item of equipment tested and indicate the last date it was tested.
C. Equipment found to be defective shall be tagged out of service and not used until repaired.

4.7 Ground Rods and Ground Wires

A. Information on locations and applications requiring ground rods may be found in Engineering Instruction Guidelines Specification 3C200 and Specifications for Engineering Specialties 4A200.
B. Multiple rods provide a reduction in resistance but may not provide adequate performance.
C. Ground wires must have sufficient capacity to carry a fault current until short circuit protection opens the circuit.

4.8 Personal Safety Measures

A. Hands, shoes, and clothing shall be dry when any energized electrical equipment is handled. Jewelry shall be removed prior to working on energized electrical equipment.
B. All protective equipment shall be inspected before each job.
C. Do not touch the metal frame of a case if it is ungrounded and you are in contact with the ground or a grounded object.
D. Only non-conductive hard hats (ANSI Z87 Class E) are allowed for use where there is a potential for injury from electric shock or burns due to contact with energized parts.
E. Only insulated tools or handling equipment shall be used when working near energized equipment if the tools or equipment might come in contact with the parts. The insulating materials of the tools shall be protected against damage and rated for the voltage that may be encountered.

Warning 4.8

Do NOT work on anything that you are not trained and qualified to work on.

5.0 Training

5.1 Employees that are required to work on and/or utilize electrical equipment and tools shall be trained on the requirements of this procedure.

5.2 Training shall be documented.

6.0 Auditing

6.1 The requirements of this procedure will be audited during each sites annual Operations and HSSE audit and periodically during monthly site inspections.

6.2 This procedure shall be audited (and updated as necessary) every three years.

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