

ELECTRICAL SAFETY

PURPOSE

The purpose of this policy is to protect persons and property against the hazards arising from the use of electricity. This policy is not intended to outline all regulatory requirements or safe work practices that may be necessary when working with electricity. Additional requirements and guidance can be found in the policy references.

RESPONSIBILITIES

Departments shall:

Ensure that all electrical installations conform to the standards in the prevailing National Electric Code, North Carolina Building Code and local electrical codes at the time of construction, renovation, or repair.

Ensure that no electrical installations, modifications, or repairs are made by employees other than Duke-employed electricians and other trades performing electrical work within the scope of their trade, or authorized contractors.

Report all problems with building electrical systems to the appropriate maintenance department for corrective action.

Designate, where required, one or more competent persons to implement an Assured Equipment Grounding Conductor Program within the department. (See Procedures section.)

Supervisors shall:

Ensure that employees exposed to live electrical hazards are provided with adequate electrical safety equipment, personal protective equipment, and training. (See Training section.)

Ensure that electrical safety equipment (portable GFCIs, insulated gloves, mats, etc.) are periodically performance tested as per manufacturer's recommendations.

Ensure that all purchases of extension cords, surge protectors, and other electrical devices conform to the requirements of this policy.

Ensure full compliance with the detailed responsibilities of employees set forth in the work procedures applicable to their work areas.

Send for repair or replace all equipment found to be damaged or otherwise unsafe.

Employees shall:

Follow safe work practices while working on, around, or with electric equipment: First among these is to treat all electric equipment as energized unless the appropriate lock-out/tag-out procedure has been fully implemented. (See Control of Hazardous Energy Policy.)

Ask supervisors for assistance or clarification of work procedures as necessary.

Report to supervisors all electrical hazards.

OESO shall:

Maintain this policy and assist departmental heads and coordinators with their departmental electrical safety program.

Review departmental work procedures to ensure compliance with the policy and best practices.

Audit departments to ensure compliance with this policy.

Develop and conduct basic electrical safety training for employees. (See Training section.)

Contractors shall:

Ensure their activities do not interfere with the electrical supply of medically critical equipment or critical operations.

Coordinate the scheduling of any interruption of electrical supply with the Duke Project Manager assigned to their project and the appropriate maintenance shop.

Coordinate with the Duke Project Manager and the appropriate maintenance department supervisors to ensure that Duke work procedures (shut-down, lock-out/ tag-out, start-up, etc.) relevant to the project have been communicated to the contractor.

Ensure their employees abide by the portions of this policy relevant to Contractors and to the federal and state Occupational Safety & Health Administration (OSHA) standards.

PROCEDURES

Safe Work Practices

Employees shall inspect their power tools, extension cords, portable GFCIs and electrical safety equipment for damage (worn insulation, bent/ missing pins, etc.) before use.

Employees shall remove from service and tag any equipment found to be damaged or otherwise unsafe and notify their supervisor.

Extension cords shall not be plugged into one another so as to increase the overall reach. Purchase an extension cord of the appropriate length for the job.

Extension cords and equipment cords shall not be run through doorways, window openings, under carpeting or in any other manner that may result in damage to cord unless cord protectors are in place.

Extension cords & equipment cords shall be placed in such a manner as to minimize the risk of tripping over the cord.

Extension cords shall not be used as substitutes for permanent wiring. Extension cords may remain in place for no more than 30 days if they are in continuous use and otherwise comply with the requirements for extension cords. Contact the appropriate maintenance department for assistance with permanent wiring.

Power strips may be used to supply office equipment. Power strips shall not be plugged into one another so as to increase the overall reach or number of available outlets.

All employees involved in maintenance, remodeling, or repair of buildings, structures, or equipment or similar construction-like activities shall have ground-fault circuit interrupter (GFCI) protection while using equipment powered from 125 volt, single-phase, 15, 20, or 30 ampere receptacles.

Exception: If there are no actual or anticipated wet or damp conditions, and the equipment or tool is plugged directly into the permanent wiring of the building, a GFCI is not required.

Receptacles other than 125 volt, single-phase, 15-, 20-, and 30-ampere receptacles that are not part of the permanent wiring of the building or structure and that are in use by employees involved in maintenance, remodeling, or repair of buildings, structures, or

equipment or similar construction-like activities shall have ground-fault circuit-interrupter protection. Where the ground-fault circuit-interrupter protection required by this paragraph is not available, the Department shall establish and implement an Assured Equipment Grounding Conductor Program covering cord sets, receptacles that are not a part of the building or structure, and equipment connected by cord and plug that are available for use or used by employees on these receptacles.

General Equipment Requirements

All extension cords purchased or in use shall be the three wire type and have a minimum wire size of 14 AWG. After the effective date of this policy, extension cords purchased for maintenance or construction use shall have ground-fault circuit interrupter (GFCI) protection integrated into the design.

All power strips purchased or in use shall have a cord 6 feet or less in length, a 15 amp circuit breaker/ fuse, and a surge protector.

The purchase or use of cube taps to expand the capacity of a duplex outlet shall be prohibited.

Receptacles and plugs having grounding contacts shall have those contacts effectively grounded, except as allowed by the National Electrical Code. The use of adapters that eliminate the equipment ground is prohibited.

Building Design Requirements

All electrical installations shall conform to the standards in the prevailing National Electric Code, North Carolina Building Code and local electrical codes at the time of construction, renovation, or repair.

Electrical equipment shall be installed in a neat and workmanlike manner.

Unused openings in boxes, raceways, auxiliary gutters, cabinets, equipment cases, or housings shall be effectively closed to afford protection substantially equivalent to the wall of the equipment.

The width & depth of working space around electrical equipment shall comply with the National Electrical Code at the time of construction. For electrical panels operating at 600V or less, an area 36 inches by 36 inches, centered on the panel, is the minimum generally required.

Regardless of the date of construction, all 125V, single-phase, 15 & 20 ampere receptacles installed in bathrooms or on rooftops shall have ground-fault circuit interrupter (GFCI) protection.

Regardless of the date of construction, all 125V, single-phase, 15 & 20 ampere receptacles exterior to the building shall have ground-fault circuit interrupter (GFCI) protection.

TRAINING

OESO provided

GS141: Basic Electrical Safety for Employees

Maintenance Department provided

GS142: Arc Flash Hazards for Maintenance Employees (NFPA 70E)

GS143: Work Practices for High Voltage Electricians

REFERENCES

Code of Federal Regulations, Title 29, Part 1910, Subpart H (OSHA), *Electrical*

Code of Federal Regulations, Title 29, Part 1926, Subpart K (OSHA), *Electrical*

National Fire Protection Association (NFPA)

101, *Life Safety Code*

70, *National Electrical Code*

70E, *Employee Electrical Safety*

North Carolina Building Code

APPENDIX A: ASSURED EQUIPMENT GROUNDING CONDUCTOR (AEGC) PROGRAM

REGULATORY REQUIREMENT

Receptacles *other than 125 volt, single-phase, 15-, 20-, and 30-ampere receptacles* that are not part of the permanent wiring of the building or structure and that are in use by employees involved in maintenance, remodeling, or repair of buildings, structures, or equipment or similar construction-like activities shall have ground-fault circuit-interrupter protection. Where the ground-fault circuit-interrupter protection required by this paragraph is not available, the Department shall establish and implement an **Assured Equipment Grounding Conductor (AEGC) Program** covering cord sets, receptacles that are not a part of the building or structure, and equipment connected by cord and plug that are available for use or used by employees on these receptacles.

DEPARTMENT RESPONSIBILITIES

The Department shall designate one or more competent persons to implement the AEGC program.

A written description of the AEGC program, including the specific procedures adopted by the Department, shall be available for inspection by OESO and review by affected employees.

PROCEDURES

Each cord set, attachment cap, plug, and receptacle of cord sets, and any equipment connected by cord and plug, except cord sets and receptacles which are fixed and not exposed to damage, shall be visually inspected before each day's use for external defects, such as deformed or missing pins or insulation damage, and for indications of possible internal damage. Equipment found damaged or defective shall not be used until repaired. The following tests shall be performed on all cord sets and receptacles which are not a part of the permanent wiring of the building or structure, and cord- and plug-connected equipment required to be grounded:

- All equipment grounding conductors shall be tested for continuity and shall be electrically continuous;
- Each receptacle and attachment cap or plug shall be tested for correct attachment of the equipment grounding conductor. The equipment grounding conductor shall be connected to its proper terminal; and

- All required tests shall be performed before first use; before equipment is returned to service following any repairs; before equipment is used after any incident which can be reasonably suspected to have caused damage (for example, when a cord set is run over); and at intervals not to exceed 3 months, except that cord sets and receptacles which are fixed and not exposed to damage shall be tested at intervals not exceeding 6 months;

The Department shall not make available or permit the use by employees of any equipment which has not met the requirements of the previous paragraph.

Tests performed as required by this program shall be documented. This test record shall identify each receptacle, cord set, and cord- and plug-connected equipment that passed the test and shall indicate the last date it was tested or the interval for which it was tested. This record shall be kept by means of logs, color coding, or other effective means and shall be maintained until replaced by a more current record. (An example log form follows.) The record shall be made available within the Department for inspection by OESO and any affected employee.

REFERENCES

Code of Federal Regulations, Title 29, Part 1910, Subpart H (OSHA), *Electrical*

Code of Federal Regulations, Title 29, Part 1926, Subpart K (OSHA), *Electrical*

ELECTRICAL SAFETY POLICY SELF-AUDIT CHECKLIST

Revised: 04/2008

Where applicable, the correct answer for all questions is "YES." "NO" answers require corrective action.

<i>I. Questions for <u>ALL</u> Department work areas:</i>	<i>YES</i>	<i>NO</i>	<i>N/A</i>
1. Are all extension cords & equipment cords run so as to prevent damage to the cord insulation?			
2. Are all extension cords & equipment cords placed in such a manner as to minimize the risk of tripping over the cord?			
3. Do extension cords remain in use for less than 30 days?			
4. Are all extension cords purchased or in use of the three-wire type with a minimum wire size of 14 AWG? (16 AWG is not acceptable.)			
5. Do all power strips purchased or in use shall have a cord 6 feet or less in length, a 15 amp circuit breaker/ fuse, and a surge protector?			
6. Is plugging extension cords or power strips into one another so as to increase their length or capacity prohibited?			
7. Is the purchase or use of cube taps prohibited?			
8. Is the use of adapters that eliminate the equipment ground (3-prong to 2-prong adapters) prohibited?			
9. Do all electrical panels have a clear area at least 36 inches by 36 inches, centered on the panel, in front?			
10. Are the faceplates on switches and receptacles present and do they completely cover the switch/ receptacle wiring?			
11. Are receptacles in the employee bathrooms protected by a GFCI?			
12. Do all employees know how to contact maintenance for their location?			
13. Have all employees taken Basic Electrical Safety for Office Employees?			
<i>II. Additional Questions for <u>MAINTENANCE/ CONSTRUCTION</u> Departments:</i>	<i>YES</i>	<i>NO</i>	<i>N/A</i>

1. Do employees inspect their power tools, extension cords, and portable GFCIs (worn insulation, bent/ missing pins, etc.) before use?			
2. Are all employees involved in maintenance, remodeling, or repair of buildings, structures, or equipment or similar construction-like activities provided ground-fault circuit interrupter (GFCI) protection while using equipment powered from 125 volt, single-phase, 15, 20, or 30 ampere receptacles?			
3. Do extension cords purchased for maintenance or construction use have ground-fault circuit interrupter (GFCI) protection integrated into the design?			
4. Do 15 & 20 amp receptacles on rooftops and in outdoor areas have GFCI protection?			
5. Have all employees taken Basic Electrical Safety for Maintenance Employees?			
6. Have employees who work on high voltage systems or who are at risk of exposure to arc-flash been trained on work practices and do they have appropriate electrical safety equipment & PPE for their work?			
<i>III. Additional Questions for HIGH VOLTAGE/ ELECTRICAL Shops:</i>			
1. Are insulating equipment (gloves, mats, etc.) inspected for damage before each day's use and after any incident that could be suspected of having caused damage?			
2. Are insulating gloves air tested before each day's use and after any incident that could be suspected of having caused damage?			
3. Are insulating equipment stored in such a location and in such a manner as to protect it from light, temperature extremes, excessive humidity, ozone, and other injurious substances and conditions?			
4. Have rubber insulating gloves been electrically tested within the past 6 months?			
5. Have rubber insulating sleeves been electrically tested within the past 12 months?			
6. Have rubber insulating blankets been electrically tested within the past 12 months?			