Electrical

A. General

1. This section covers all electrical/electronic circuits and distribution systems greater than 30 volts, including indoor, outdoor and shipboard systems. This section also includes all machine tools, cranes, mobile equipment, utility equipment, test equipment and analyzing equipment. This section is applicable to all electrical installations, modification, preventive maintenance and repairs.

2. Contractors who work on electrical systems described above shall have an approved electrical work program that explains how employees will be protected from arc, blast and shock hazards. Any significant deviations from *NFPA 70E® Standard for Electrical Safety in the Workplace®* must be explained in the contractor written program.

B. Work and Testing of Electrical Systems

1. All electrical circuits are to be considered as live (energized) until positively proven dead (de-energized). To check a circuit to see if it is energized, a suitable indicating device shall be used. Intentionally taking a shock from any voltage shall never be done. The contractor shall ensure that any employee who receives an electrical shock to report to qualified medical professionals for a precautionary evaluation. An electrical shock incident report shall be filled out and a copy shall be forwarded to the O27 EH&S department.

2. Before an employee is permitted to work on or near an electrical circuit, the contractor shall ensure the circuit is de-energized, and that the individual who is going to do the work checks the circuit at the point at which the work is to be done to ensure that it is actually de-energized.

3. The contractor shall also ensure, before an employee is permitted to work on an electrical circuit, that the switch, circuit breaker, fuse holder, etc. is identified and secured. For shipboard systems, the unit shall be tagged out in accordance with NNS Procedure SSP Q-1093.

4. For non-shipboard systems, the unit shall be locked and tagged as required elsewhere in this Manual. The red tags shall not be removed nor the circuit energized until the work on the circuit has been completed.

5. The contractor shall ensure that contractor employees, when testing a circuit, always:

a. Ensure that voltage and current measuring instruments with proper CAT rating are in good working condition prior to commencing work/testing

b. Ensure that removable test leads on portable meters are securely connected to the meter when in use,

c. First check the testing device on a known live circuit to ensure that the tester is in proper working order,

d. Next test the "live" side of the circuit,

e. Then test the "load" side of the circuit,

f. Then retest the "live" side,

g. Finally, retest the testing device on a known live circuit.

6. The contractor shall ensure work/testing is not performed on energized electrical circuits unless it is absolutely essential to ships power plant operations or job completion and it cannot be accomplished by other means. In such cases, the employee's immediate supervisor must determine, on a daily basis that working on that specific energized electrical circuit is authorized, and must obtain necessary approvals from the general foreman, test supervisor, commanding officer, etc. Furthermore, the supervisor, on a daily basis, must ensure that conditions in the work area are adequate to allow working on energized electrical circuits, and that adequate personal protective equipment is provided and used.

C. Live Circuits/Equipment with voltages up to 600V AC/600V DC.

1. The requirements of this section do not apply to safety checks performed to verify that the system or component has been properly de-energized prior to changing light bulbs.

2. Prior to assigning any employee to work or test energized circuits or equipment, the contractor shall ensure that the employee has:

a. Attended an electrical safety training class,

b. Signed a statement to the effect that he/she understands requirements of this training program,

c. Passed a written examination based on the elements of this training, and

d. Certified by his employer to be competent and thoroughly familiar with the hazards of working/testing energized circuits.

3. The contractor shall ensure this training class educates the worker in the following skills:

a. An understanding of the general requirements for work or testing on energized circuits,

b. An understanding of NNS lockout, tagout and red tag procedures,

c. The ability to identify the exposed energized parts in any open type switchboard/panel,

d. The ability to identify the exposed energized parts in safety switches and lighting or power panels,

e. The ability to properly use a voltage tester to determine presence and magnitude of voltage,

f. The ability to demonstrate or explain the proper use of rubber gloves and blankets, and

g. The ability to visually check rubber blankets and gloves for holes or contamination.

h. The ability to demonstrate the proper level and use of special precautionary techniques to include appropriate arc flash personal protective equipment and insulated tools and test equipment as referenced in NFPA 70E®.

4. The contractor shall ensure that the employee being examined and the instructor who gave the examination sign the examination. The contractor shall provide documentation of this training to the NNS Contractor Coordinator upon request.

5. When removing or replacing fuses, the contractor shall ensure that fuses are removed or replaced only when the circuit is completely de-energized unless the circuit must remain energized for ship's power plant operations, testing, personnel safety, etc. The contractor shall also ensure:

a. When it is absolutely necessary to remove or replace fuses in an electrical circuit with the line terminals energized, the employee only does so under a no-load condition,

b. After the replacement of the fuse(s), the cover is closed and secured over the fuse before energizing the circuit, and

c. When fuses are removed from de-energized electrical equipment, the fuse holder carriages (blown fuse indicating type) are also removed and the open

receptacle taped over. (With fuse carriages installed, a voltage is still supplied to equipment through the brown-fuse indicator circuit.)

6. When testing or adjusting an energized circuit, where such testing requires the periodic de-energizing and re-energizing of the circuit, the contractor shall ensure that caution tag(s) are hung on the breakers, fuse holder, disconnects, receptacle plugs etc., to control the circuit. The tags, breakers, fuse holders, etc. shall be under the direct control of the individual doing the testing or adjusting.

7. With respect to work areas, the contractor shall ensure that ample illumination is available for measurement, adjustment, or trouble-shooting, and that the work site is free of unusual hazards (e.g. water on the deck, conditions that could cause loss of balance or crowding, etc.). Every care shall be taken to insulate personnel from ground. Exposed energized buss-bars, within 3 feet of any work area, shall be insulated with rubber blankets, and the worker(s) shall be insulated from ground by rubber matting covering the deck and rubber blankets covering energized components. The insulating material shall be free of contamination (chemicals, metal, cuts, etc.) that may impair the dielectric properties of the material. When working in a congested area, the area shall be posted “Danger — Do Not Enter — Work/Testing of Energized Circuits in progress.”

8. With respect to tools and equipment, the contractor shall ensure work benches are maintained uncluttered when testing energized electrical equipment, and handles of all tools used for working or testing or adjusting energized electrical or electronic circuits shall be insulated or non-conducting.

9. With respect to personal protective equipment, the contractor shall ensure their employees who routinely work/test electrical/electronic circuits are assigned hard hats approved for electrical work. Other safety equipment such as rubber gloves, insulating blankets, etc. shall be available and used as required by the job, and rubber personal protective equipment shall conform to American Society Testing for Testing and Materials requirements.

10. With respect to work practices, the contractor shall ensure personnel remove any watch, ring, chain, metal, or loose clothing which might contact or place a body part into contact with live parts. Employees’ clothing and shoes shall be dry or they shall wear special rain gear and boots (this does not preclude normal body perspiration). Work shall not commence until defined hazards have been removed. Employees shall visually inspect rubber-molded plugs immediately prior to each use. Employees shall inspect rubber-molded power and lighting streamers prior to disconnecting, and the circuit shall be de-energized at a point ahead of the plug prior to disconnecting the plug if damage is found. Employees shall use only one hand to do the work, in so far as practical, and shall wear rubber gloves on both hands, or, as a minimum, on the hand used for handling tools.

11. Contractors shall ensure that their employees do not work on energized power distribution systems 600 VOLTS or greater at NNS.

12. Contractors shall ensure that their personnel who connect or disconnect equipment on the secondary side of welding systems de-energize circuits before making or breaking connections whenever possible. When it is not possible to de-energize the system, they shall use insulated tools and wear gloves before making or breaking connections or replacing fuses. Furthermore, contractors shall ensure that their personnel make no splices in energized temporary services, visually inspect all primary power plugs immediately prior to each use, and ensure that all equipment is in good working condition prior to energizing the secondary side.