7.B.6 - ELECTRICAL SAFETY – WORKING ON ENERGIZED CIRCUITS

1 PURPOSE

a) To ensure that all persons working aboard CCG vessels / stations are protected from accidental exposure to electrical currents and flash burns.

b) It is important to be aware that working on energized systems is not recommended and should not be a routine practice. When necessary, because of operational requirements or for troubleshooting circuits, energized work must be performed by the person in charge or qualified persons under the terms of the *Maritime Occupational Health and Safety (MOHS) Regulations - Part 15 Electrical Safety*.

2 RESPONSIBILITIES

2.1 COMMANDING OFFICER

a) The Commanding Officer shall ensure that this procedure is applied aboard the vessel.

2.2 CHIEF ENGINEER, OR DELEGATE

a) The Chief Engineer, or delegate, shall approve work on all energized circuits. These operations shall be logged in a controlled register.

b) The Chief Engineer shall consult with the Commanding Officer prior to locking out or disabling any energized system or equipment which affects the operational readiness or navigational safety of the vessel. The Commanding Officer shall also be notified when the circuit is re-energised. Special consideration shall be given prior to disabling any energized system or equipment that affects the operational readiness of the vessel. The Chief Engineer shall produce a list of critical systems / equipment in compliance with section 3.3 (d) of this procedure.

c) Prior to performing any work on energised electrical circuits, the Chief Engineer shall ensure that one employee at the worksite has been trained in CPR and is able to fulfill that requirement. The employee shall remain on site for the duration of the work being performed.

2.3 EMPLOYEE

a) No employee shall commence work on any electrical circuit or equipment that must remain energized without the prior approval of the Chief Engineer or delegate.

3 INSTRUCTION

3.1 GENERAL

a) When performing energized work, a risk assessment and "Energized Circuit Work Permit" shall be completed. Energized work shall never be taken lightly, implementation of best practices, judgment and knowledge of individual systems, and use of Personal Protective Equipment (PPE) is necessary to prevent or reduce the potential for injury.

3.2 CATEGORIES OF HAZARDOUS SITUATIONS

a) Electrification and Electrocution.

- These are situations where a worker's body comes into direct contact with or exposed to a live electrical device. These hazards are controlled by wearing PPE and by maintaining a safe distance according to the voltage present.

b) Arc Flash Burns.

- An equipment malfunction can create an arc flash with consequences that can cause injury to an employee. The amount of energy released by the arc event is directly related to the voltage of the circuit, the short circuit capacity at the point of malfunction, and the amount of time needed for circuit protection to deploy.

c) Arc Blast.

- When copper changes instantly from a solid to a gas, it causes increased pressure, hazardous noise levels, and a shower of hazardous debris. The sound pressure can be as strong as 160 dB, and projectiles can reach a velocity of 1100 km/h.

3.3 APPLICATION

a) Personal Protective Equipment and Appropriate Measuring Instruments

- The *CSA Standard Z462-12* serves to accurately determine what PPE is appropriate for a given task. It also defines minimum approach distances and arc rated and flame resistant clothing protection systems. At a minimum, a face shield and protective gloves shall be worn which meet electrical standards for protection for the voltage present.
- Wearing synthetic fibres or metal accessories is prohibited while performing any work on live circuits, for all classes of vessels.
- The tools used to perform live electrical work must be fitted with an insulating material. Insulating mats must be inspected regularly to ensure that they are completely intact and have a certificate of conformity with the standard in effect. Electrical equipment solely used in the testing of live circuits shall be tested as per manufactures instructions. Where no instructions exist the equipment shall be tested at a minimum annually.

b) Vessel / Vessel Class Specific Practices

- Work instructions shall be developed specific to each vessel for energized circuit work. These instructions shall provide employees, guidelines for the categories of tasks to be performed in accordance with the *CSA Standard Z462-12*.

c) A Risk Assessment attached to the Work Permit must be located on site and include a rescue plan which identifies the circuit to be shut down in the event on an emergency.

- A permit for energized circuit work is mandatory and shall be completed if the equipment operates at a voltage of **240 V or above** and is powered by a transformer **greater than 125 kVA**, or if prior to the closest upstream protection device, the equipment feeder cables are in a shared enclosure with a voltage present that is above 200V.
- The Chief Engineer shall maintain a register of energised circuit work permits which once completed shall be kept onboard for 12 months.

d) The Chief Engineer shall produce a list of critical systems / equipment that due to their nature are required for operational readiness for the vessel and remain in a constant energized state. This list shall remain in the permit register for reference. The Energized Electrical Work Permit shall be issued when any electrical troubleshooting work is being performed on this equipment.

3.4 SYSTEM UNDER TESTING, TROUBLESHOOTING AND RETURN TO SERVICE.

a) If, at any time, an unforeseen situation should occur during the troubleshooting situation of energized circuits, including the detection of a short etc the troubleshooting work shall be stopped immediately and necessary repairs conducted. During the troubleshooting no unexpected loads shall be introduced into the system,

b) When the electrical equipment is put back into operational status it must be proven ready for safe operation.

4 DOCUMENTATION

- CSA Standard Z462-12
- Site Specific Work Instructions
- Energised Circuit Work Permit
- Register of Energised Circuit Work Permits
- Log Book Entries

ENERGIZED CIRCUIT WORK PERMIT	VESSEL: CCGS
This work permit is required when working on equipment operating at **240 volts or more** and powered by a transformer of **more than 125 kVA**.	
Circuit #	Location:
Period of validity (Date):	
MAINTelligence Work order number:	
Description of Equipment / System:	
Reason for energized work: ☐ Equipment troubleshooting ☐ System calibration ☐ Other (specify) _____	
Risk assessment: The following section shall be completed.	
Checklist: ☐ Safe environment ☐ Work procedures met ☐ Inspections during work ☐ Installation of signage required ☐ Control room and wheelhouse notified of work ☐ Personal Protective Equipment ☐ Insulated material involved (tools, mat, ladder etc.) ☐ Presence of lockout/tagout if required ☐ Safety tests required	☐ Tags or signs required ☐ Measuring instruments used appropriate to work ☐ Metal accessories (jewellery, watch, belt buckle, etc.) removed ☐ Clear and effective communications among team RESCUE PLAN ☐ Emergency power disconnect switch identified and accessible ☐ Other (Specify) _____ _____
Emergency procedures to be followed:	
Worker: (Print)	Signature:
Chief Engineer:	Signature:
Date issued:	
Return to service completed / Functional inspection satisfactory Yes No Comments: Date: Time:	