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ISOLATION & BARRIER PROCESS WHEN TESTING RELAY AND CONTROL EQUIPMENT

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ERROR PREVENTION TOOLS associated with this Work Procedure



SEE THE ERROR PREVENTION ICON QUICK REFERENCE GUIDE IN THE INTRODUCTION SECTION FOR A DETAILED EXPLANATION OF EACH ACTION

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I. SCOPE

Human error is the main cause of inadvertent operations. It is important to understand, that all members of a crew, need to stay alert and use Human Error Prevention Tools. Review energy source controls, isolation of relay protection and the use of robust operational barriers prior to performing any relay and control task is all part of preventing an unexpected operation of substation equipment. This procedure has been developed to assist with identifying the risks associated when testing relay protection systems, role expectations of technicians, the importance of isolating the equipment and defining work zones. It shall be used during Periodic Maintenance or any time there is a potential to operate high voltage equipment.

II. DEFINITIONS

- A. Barriers-** A device used to identify and deter the operation of equipment or prevent personnel from entering in-service panels during maintenance activities. Also used to cover or protect exposed energized components. (Orange)
- B. Critical Work Zone-** A work zone designated by the Relay Technician where tedious testing activities are being performed without distractions. A means to prevent other individuals from entering the area are commonly put into place.
- C. Flagging-** Signage, safety tape or any device used to identify the equipment that is included as part of the testing or maintenance activity. (Pink)
- D. Isolation-** The act of separating circuits to prevent operation of equipment.
- E. Place keeping-** A Method to identify only the intended relays or equipment to be operated and to keep track of the progress of the job.
- F. Verification Practices/Peer Checks-** Verification and Peer Checks are confirmations from technicians that the task is being performed correctly.
- G. Work Zone-** Panels, racks or areas where the associated relays, meters and equipment are located.

III. SAFETY

Job Briefing/Risk Assessment:

Prior to starting work and during the planning process, the Job Site Supervisor shall conduct a Job Briefing. This briefing shall include PPE Requirements and a Risk Assessment to identify potential risks and determine methods to mitigate hazards. **(REFER TO AND FOLLOW THE BGE SAFETY MANUAL, SECTION VI C., JOB BRIEFING (S.A.F.E. FORM) FOR INFORMATION.)**

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The entire crew shall conduct an **EVENT-FREE CHECK** as part of their pre-job safety brief. Error trap identification shall be included in the EVENT-FREE CHECK. (Refer to Event-Free Performance Tool Book.)

Follow the requirements for station entry. Assure that the proper permit and tagging requirements have been met before starting work. Customer reliability constraints and preparations also apply.

IV. ISOLATION & BARRIER PROCESS WHEN TESTING RELAY AND CONTROL EQUIPMENT

A. Overall Preparation for Isolation

1. The entire crew shall discuss the scope of the work to be performed.
2. The entire crew shall review the outage/abbreviated outage conditions using the Station Equipment Designation Diagram (EDD) or One-Line diagram as reference.
3. The entire crew shall review the Permit and Tagging requirements for the task refer to the Permit and Tagging Manual.
4. The entire crew **MUST** walk down the outage to assure proper tagging of the outage has been met as discussed in step 2 (refer to the Station EDD or One-Line diagram)
5. Assemble all associated engineering drawings necessary for the task. Assure there is **NO** risk of operating in-service equipment when placing of prints on panels.
6. Locate and discuss “work zones” where associated relay and meter panels are located. Also includes any associated control handles, communication panels, DC fuse cabinets etc.
7. Ask the question, “**What can get us in trouble?**” Refer to the necessary engineering drawings and discuss the actions to prevent an inadvertent operation. Identify and document isolation points on the Equipment Isolation / Maintenance Alteration Log (See Figure 1).

B. Identify Roles to Perform Isolation

The role of each technician is critical to the process of performing isolation on relay and control equipment.

1. Two Person Crew

- a. Identify the technician assigned to **READ** the print
- b. Identify the technician assigned to **PERFORM** the isolation to the protection
- c. **PEER CHECKS** shall be a shared responsibility between both technicians

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2. Three Person Crew

- a. Identify the technician assigned to **READ** the print
- b. Identify the technician assigned to **PERFORM** the isolation to the protection
- c. Identify the technician assigned to **PEER CHECK** the technician performing the isolation and/or the technician reading the print.

3. Four Person Crew

- a. Identify the technician assigned to **READ** the print
- b. Identify the technician assigned to **PERFORM** the isolation to the protection
- c. Identify the technician assigned to **PEER CHECK** the technician reading the print.
- d. Identify the technician assigned to **PEER CHECK** the technician performing the isolation to the relay protection

C. Performing the Isolation

The role of each technician is critical to the process of performing isolation on relay and control equipment.

1. It is required that the following Error-Prevention tools be used while Performing Isolation for Relay and Control Equipment:
 - a. 3-Way Communication
 - b. Phonetic Alphabet
 - c. Place Keeping
 - d. Questioning Attitude
 - e. S.T.A.R.
 - f. Stop when unsure
 - g. Verification Practices
2. **Identify** and **Record** each abnormal isolating test provision on the Equipment Isolation / Maintenance Alteration Log (Refer to prints).
3. **Verify** and **Isolate** each isolating test provision, then apply a pink Individual Isolation Card.
4. **Record** the number of pink Individual Isolation Card on the Equipment Isolation / Maintenance Alteration Log (Refer to prints).
5. **Apply an orange barrier** to each individual test switch that **WILL NOT** be operated during the course of testing. **Use caution when applying barriers to trip- sensitive equipment.**

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D. Creating Work Zones

A “Work Zone” shall be defined as panels or areas where associated relay and meter equipment are located.

The role of each technician is critical to the process of Creating Work Zones.

1. Identify equipment located within or in close proximity of the work zone that **SHALL NOT** be operated. Apply Orange Barrier.
2. Identify all areas (panels) located in close proximity of the work zone that **SHALL NOT** be entered. Apply Orange Barrier.
3. Apply robust operational barriers (Orange) supplied in the Relay and Control Error Prevention Work Zone Kit (SPCW 4710) to the identified areas and equipment to prevent personnel from entering.
4. Equipment and relays that will be operated and/or tested **outside of the work zone** (automatic switches, PK blocks, etc.) shall be identified by “flagging” with pink dots or relay test card.

E. Return Equipment to Service

The role of each technician is critical to the process of Returning Equipment to Service.

1. It is required that the following Error-Prevention tools be used while Performing Isolation for Relay and Control Equipment:
 - a. 3-Way Communication
 - b. Phonetic Alphabet
 - c. Place Keeping
 - d. Questioning Attitude
 - e. S.T.A.R.
 - f. Stop when unsure
 - g. Verification Practices
2. Assure that any temporary relay settings have been replaced with the Active relay settings
3. Assure that all temporary yellow jumpers have been removed and accounted for
4. Returning all isolating test provisions to normal
 - a. Refer to the Equipment Isolation / Maintenance Alteration Log
 - b. Where applicable, isolation test provisions shall be tested prior to closing or returning to its normal state to prevent unexpected operations.

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- c. Assure all Test Provisions are returned to normal by accounting for all pink individualized numbered isolation cards as recorded on the Equipment Isolation / Maintenance Alteration Log
- 5. Carefully remove all orange robust operational barriers from panels and equipment. **Use caution when removing barriers from trip sensitive equipment.**
- 6. Carefully remove all pink flagging from panels and equipment. **Use caution when removing flagging from trip sensitive equipment.**

V. REFERENCES

- A. Event – Free Performance Tool Book
- B. SPCWP4710 Error Prevention Work Zone Kit
- C. Permit and Tagging Manual
- D. SAFE Form

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Equipment Isolation / Maintenance Alteration Log

SHEET _____ OF _____

STATION/LOCATION _____ DATE _____

EQUIPMENT _____ (CIRCLE) PM / CM

CARDS PLACED BY: _____ PERMIT# _____

PRIOR TO STARTING WORK ASSURE YOURSELF THAT EQUIPMENT IS SAFE

| Card Number | Description of Action | Alteration | | | Restoration | | |
|-------------|-----------------------|------------|---------------------|--------------|-------------|---------------------|---------------|
| | | Initials | Peer Check Initials | Date Altered | Initials | Peer Check Initials | Date Restored |
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Transferred to: _____ Date: _____

Retain for Future Reference

(Additional Notes)

Figure 1