Test and Inspect MSWGR #1 and #2 Square “D”, Power-Zone III Switchgear

Tank Farm Maintenance Procedure

Effluent Treatment Facility

This procedure is past its PERIODIC REVIEW DATE
Click on Justification Coversheet and Fill Out before using

USQ Not Required – ETF is a <Hazard Category 3 Radiological Facility

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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides a safe, uniform way to test and inspect MSWGR #1 and MSWGR #2, Square “D” Company, Metal-Enclosed Low Voltage Drawout Power-Zone III PZ Switchgear, with DS/DSL circuit breakers. In addition, this procedure provides an opportunity for cubicle cleaning of sub-breaker compartments that may need to be completed as part of DS/DSL Series circuit breaker inspection and testing performed per ETF-EL22052, DS Series Circuit Breaker Inspection and Testing.

1.2 Scope

Procedure instructions provide for main circuit breaker removal and cubicle cleaning, and bus and general inspections. Portions of the procedure may be utilized as directed by the SOM or electrical engineer to support cleaning of sub-breaker compartments as part of DS/DSL Series circuit breaker inspection and testing performed per ETF-EL22052.

MSWGR #1 outage will shut down: Master Control Console 1, 2, 3, 4, Vapor Compressor (60I-C-1) and Dryer Boiler (65A-B-1).

MSWGR #2 outage will shut down: MDPs 1, 2, 3, and Central Stations 45B-E-1A, 45B-E-2A, 45B-E-1B, 45B-E-2B.

2.0 INFORMATION

2.1 General Information

2.1.1 DS /DSL Series circuit breaker inspection and testing is performed per ETF-EL22052.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personal Safety

**WARNING** - An arc flash hazard exists whenever main switchgear breakers are being disconnected and removed from cubicle and during reinstallation into cubicle, which could cause injury or death.

3.1.1 Lock and tag protects personnel from the unexpected release of hazardous energy or materials. Under these circumstances, lock and tag is required in accordance with procedure DOE 0336, Hanford Site Lockout/Tagout Procedure.

3.2 Radiation and Contamination Control

3.2.1 Work in radiological areas will be performed using a radiological work permit following review by Radiological Control per ALARA Work Planning procedure, TFC-ESHQ-RP_RWP-C-03.

3.3 Environmental Compliance

3.3.1 In the event of a spill/leak/release, notify the SOM/FWS and respond per ETF-ERP-85B-003, Emergency Spill or Release at ETF.
4.0 PREREQUISITES

4.1 Special Tools, Equipment, and Supplies

NOTE - M&TE used to collect acceptance criteria data during performance of this procedure shall meet the following requirements:

- Be within its current calibration cycle as evidenced by an affixed calibration label
- Be capable of desired range
- Accuracy is equal to or greater than M&TE tolerance specified on PM/S data sheet or is at least four times greater than specified device tolerance.

The following supplies may be needed to perform this procedure:

- Vacuum cleaner, (portable) with non-conductive hose attachments
- Scotch-Brite (scrubbing pad, not metal)
- CRC Contact Cleaner 2000 VC
- 1000 V DC megohmmeter
- Torque wrench
- Micro-ohmmeter, calibrated
- Voltage rated gloves/sleeves as required for shock protection/voltage checks
- Electrical PPE to meet the identified hazard/risk category in the current documented arc flash and shock hazard analysis for this task (reference National Fire Protection Association 70E – 2009, Table 130.7(C)(10)).
4.2 Performance Documents

The following documents may be needed to perform this procedure:

- DOE-0336, Hanford Site Lockout/Tagout Procedure
- ETF-25B-001, Electrical Distribution System Startup and Operation
- ETF-25B-002, Electrical Distribution System Shutdown
- 5-EDS-359 DS-416, DS-632 and SPB-100 Low Voltage Circuit Breaker Shop Maintenance and Testing
- H-2-89013, System One Line Diagram

4.3 Field Preparation

4.3.1 BEFORE opening main switchgear circuit breaker, ENSURE all loads are shed for switchgear being worked per ETF-25B-002.
5.0 PROCEDURE

Special Instructions

Switchgear 1 and 2 may be worked in any order, or in parallel.

A keyed interlock (A1) is provided to prevent operation of switch A when breaker B is closed. The high voltage switch can be locked open or closed, “L-O-C” means lock open or lock-closed. The circuit breaker has an interlock to lock the breaker open, “L O” means lock-open. Both have an unlocked position.

5.1 Circuit Breaker Removal and Cubicle Cleaning

5.1.1 ENSURE lock and tag is installed per DOE-0336.

5.1.2 ENSURE switchgear main circuit breaker is OPEN.

5.1.3 CRANK breaker to REMOVE position.

5.1.4 PULL breaker to rail stops (extension rails need not be pulled out).

5.1.5 PUSH IN/HOLD rod to the left of interlock key (A1) above main switchgear breaker.
5.1 Circuit Breaker Removal and Cubicle Cleaning (Cont.)

5.1.6 **TURN** key 180º to lock open (rod is mechanically held in and key is now free) **AND**

**REMOVE** key.

5.1.7 **TURN** crank until the position indicator moves to CONN position.

5.1.8 **PUSH** breaker in until roller touches the blocking plate.

5.1.9 **REMOVE** main breaker

5.1.10 **CLOSE** compartment door.

**NOTE** - Inspection and testing of circuit breakers may be performed per 5-EDS-359 while circuit breaker cubicle maintenance is being performed. Sections 5.2, and 5.3 may be done concurrently with the remainder of this section.

5.1.11 **PERFORM** Steps 5.1.12 through 5.1.28 for each cubical.

5.1.12 **RACK OUT** AND **REMOVE** circuit breaker from switchgear.

**Cubicle Cleanliness**

5.1.13 **INSPECT** for cleanliness.

5.1.14 **REMOVE** dust and dirt accumulations with the following:

- Vacuum cleaner
- Rags
- Brush.

5.1.15 **IF** oily dirt is present, **CLEAN** with rag moistened with non-flammable solvent.

5.1.16 **RECORD** findings on PM/S data sheet.
5.1 Circuit Breaker Removal and Cubicle Cleaning (Cont.)

**Cubicle Wiring**

5.1.17 IF wires are in cubicle, DO NOT DISCONNECT any compartment wiring.

5.1.18 INSPECT wiring for the following:
- Damaged insulation
- Loose terminations
- Evidence of overheating.

5.1.19 TIGHTEN loose connections.

5.1.20 REPAIR minor damage to insulation with a UL-approved vinyl plastic electrical tape.

5.1.21 RECORD findings on PM/S data sheet.

**Cubicle Hardware**

5.1.22 INSPECT hardware for the following:
- Damage
- Rust and corrosion
- Loose or missing parts.

5.1.23 TIGHTEN the following to torque values shown on Table 1 - Torque Table:
- Loose screws
- Nuts
- Bolts.

5.1.24 REPLACE the following:
- Missing cotter pins
- Missing retainers.

5.1.25 RECORD evidence of the following in comments section of PM/S data sheet:
- Corrosion
- Other damage.
5.1 Circuit Breaker Removal and Cubicle Cleaning (Cont.)

Auxiliary Contacts

5.1.26 **INSPECT** auxiliary contacts in cubicle for evidence of the following:
- Arcing
- Overheating.

5.1.27 **POLISH** contacts with Scotch-Brite pad.

5.1.28 **RECORD** findings on PM/S data sheet.

5.2 Bus Inspection

5.2.1 **ENSURE** all feeder circuit breakers in switchgear are open.

5.2.2 **REMOVE** back covers from switchgear enclosure to expose bus.

5.2.3 **MEASURE** as-found insulation resistance of the following:
- Bus
- Phase-to-phase
- Phase-to-ground.

5.2.4 **RECORD** insulation resistance on PM/S data sheet.

5.2.5 **MEASURE** total resistance of each phase bus from load side of main circuit breaker cubicle to each circuit breaker cubicle **AND**

**RECORD** bus connection resistance on PM/S data sheet.

5.2.6 **INSPECT** bus for the following:
- Damage
- Signs of heating.

5.2.7 **RECORD** findings on PM/S data sheet.

5.2.8 **AT 75% of torque table values, CHECK** random sample of bolts at the following connection points:
- Wire/bus,
- Bus/bus.

5.2.9 **RECORD** findings on PM/S data sheet.
5.2 Bus Inspection (Cont.)

5.2.10 AT 75% of torque table values, CHECK all accessible bolts on ground bus AND

RECORD findings on PM/S data sheet.

5.2.11 CHECK as-found cleanliness of bus AND

RECORD on PM/S data sheet.

5.2.12 REMOVE dust from the following:
- Bus
- Connections
- Supports
- Enclosure surfaces.

5.2.13 WIPE bus clean with contact cleaner.

5.2.14 CLEAR the following:
- Vents
- Grills
- Drip pans.

5.2.15 CHECK all bus areas and cubicles for obstructions or other conditions that might reduce safe electrical clearances AND

RECORD findings on PM/S data sheet.

5.2.16 MEASURE as-left insulation resistance of the following:
- Bus
- Phase-to-phase
- Phase-to-ground,

5.2.17 RECORD findings on PM/S data sheet.
5.3 General Inspection

Panel Mounted Devices, Relays, Meters, and Interlocks

5.3.1 **INSPECT** for signs of the following:
- Overheating
- Broken/loose terminals.

5.3.2 **TIGHTEN** loose mounting hardware.

5.3.3 **RECORD** findings on PM/S data sheet.

Control Wiring

5.3.4 **INSPECT** terminals for tightness on the following:
- Control wiring
- Current and potential transformers
- Terminal blocks
- Ground bus.

5.3.5 **TIGHTEN** loose terminals.

5.3.6 **RECORD** findings on PM/S data sheet.

5.4 Restoration

Special Instructions

Confirmation is required that all other related switchgear maintenance activities being performed during this outage have been completed and/or that switchgear equipment is in a safe configuration prior to restoring power to the switchgear.

5.4.1 **RESTORE** to as-found configuration.

5.4.2 **REINSTALL** back covers on switchgear.

5.4.3 **PLACE** main breaker in cubicle.

**NOTE** - Steps 5.4.4 through 5.4.7 require Electrical Utilities personnel.

5.4.4 **IF** lock and tag was installed, **REQUEST** its removal.

5.4.5 **INSERT** key in interlock on high voltage switch **AND**

**TURN** to unlock.
5.4 Restoration (Cont.)

5.4.6 CLOSE high voltage switch.

5.4.7 TURN key in the interlock on high voltage switch to lock closed. (Key is now free.)

5.4.8 RETURN key to main breaker interlock.

5.4.9 PUSH IN/HOLD rod to the left of interlock key (A1) above main switchgear breaker.

5.4.10 TURN key 180° to unlock AND RELEASE rod. (Key is now captive.)

5.4.11 ENSURE main circuit breaker is in REMOVE position.

**WARNING**

An arc flash hazard exists whenever main switchgear breakers are being disconnected and removed from cubicle and during reinstallation into cubicle, which could cause injury or death.

5.4.12 DON appropriate arc flash PPE per the EHE.

5.4.13 RACK IN breaker to CONN position.

5.4.14 RESTORE electrical distribution system to service as directed by SOM and ETF-25B-001.
5.5 Acceptance Testing

5.5.1 CONFIRM current and voltage readings on installed meters are within expected values.

5.6 Review

5.6.1 INFORM FWS test is complete.

5.6.2 (FWS) REVIEW AND ENSURE the following:
- Completed data sheets meet the acceptance criteria
- Comments sections are filled out appropriately
- Work requests needed as a result of this procedure are identified and generated
- Work request number(s) of any work documents generated as a result of this procedure, are recorded in the Comments/Remarks section of the data sheet.

5.7 Records

The performance of this procedure generates no records. However PM/S data sheets associated with the procedure are records and are maintained in the work package as record material.

The record custodian identified in the Company Level Records Inventory and Disposition Schedule (RIDS) is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.
Test and Inspect MSWGR #1 and #2 Square “D”, Power-Zone III Switchgear

Table 1 - Torque Table

NOTE - When cadmium plated bolts are used torque should be reduced to 80%. For other than metal to metal connections (i.e., metal to compound, metal to insert molded in compound part, etc.), torque should be reduced to 50%.

Heat Treated Steel Bolts

<table>
<thead>
<tr>
<th>Heat Treated Steel Bolts</th>
<th>TORQUE VALUE *</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAE 1 &amp; 2</td>
<td>SAE 5</td>
</tr>
<tr>
<td>Bolt Dia.</td>
<td>100%</td>
</tr>
<tr>
<td>1/4&quot;</td>
<td>60</td>
</tr>
<tr>
<td>5/16&quot;</td>
<td>108</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>15</td>
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<tr>
<td>1</td>
<td>282</td>
</tr>
</tbody>
</table>

*Values in shaded areas are given in inch-pounds. All other values are foot-pounds.