Inspection of Cathodic Protection System Rectifiers

Tank Farm Maintenance Procedure

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**Inspection of Cathodic Protection System Rectifiers**

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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for performing inspection of the Cathodic Protection Rectifiers.

1.2 Scope

This procedure involves inspection of Cathodic Protection Rectifiers.

2.0 INFORMATION

NONE

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 This activity is done in conjunction with an approved work package. All identified hazards, along with identified personal protective equipment will be addressed in the pre-job safety meeting.

3.1.2 If a lock and tag is required during the performance of this procedure, perform Lockout/Tagout in accordance with DOE-0336, Hanford Site Lockout/Tagout Procedure.

3.1.3 Refer to DOE-0359, Hanford Site Electrical Safety Program as guidance for electrical safety practices. An Electrical Risk Assessment form will be required prior to performing exposed electrical work and for Lockout/Tagout installation and removal.

3.2 Radiation and Contamination Control

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

3.3.1 Hazardous waste will be disposed of in accordance with TO-100-052 requirements.

3.3.2 Proper operation of the cathodic protection system is a requirement of Washington Administrative Code (WAC) 173-303-400, “Interim Status Facility Standards.” These standards reference the requirements of Title 40, CFR 265.195, “Inspections”. 40 CFR 265.195. Notification of environmental is required per TFC-ESHQ-ENV-FS-C-01, Environmental Notification, if cathodic protection engineer identifies system is not operating properly.

4.0 PREREQUISITES

4.1 Special Tools, Equipment, and Supplies

The following supplies may be needed to perform this procedure:

- Calibrated Allegro MX Field PC, minimum range 0-150 VDC
- Electrician’s voltage rated gloves
- Safety glasses
- Non-conductive clothing
- Gasket Material
- Panel Meter
- Rectifier Oil – Catalog Identification Number (CID) #0000583059-0
- DC Output Fuse – Catalog Identification Number (CID) #0000614576-3
- Calibrated Multimeter.
4.2 Performance Documents

The following documents and drawings of rectifier locations may be needed to perform this procedure.

- TO-100-052, Perform Waste Generation, Segregation, Accumulation and Clean-up.

**West area and 222S Laboratory:**

- H-14-011539 and H-14-031539 - EN-RECT-5745, RECTIFIER 44.

**East area, PUREX, and 242-A:**

- H-14-011503 and H-14-031503 - AP241-CATH-RECT-100 (Rectifier 1),
  - AP241-CATH-RECT-101 (Rectifier 2)
- H-14-011502 and H-14-031502 - AW241-CATH-RECT-100 (Rectifier 19),
  - A242-CATH-RECT-018 (Rectifier 18)
  - A241-CATH-RECT-016 (Rectifier 16)
- H-14-011506 and H-14-031506 - AY241-CATH-RECT-101 (Rectifier 7),
  - AY241-CATH-RECT-102 (Rectifier 8)
  - AY241-CATH-RECT-103 (Rectifier 31)
- H-14-011501 and H-14-031501 - AN241-CATH-RECT-100 (Rectifier 11),
  - AN241-CATH-RECT-102 (Rectifier 13)
- H-14-011507 and H-14-031507 - AZ241-CATH-RECT-041 (Rectifier 41)
- H-14-011513 and H-14-031513 - AZ241-CATH-RECT-102 (Rectifier 47),
  - AZ241-CATH-RECT-101 (Rectifier 46).

4.3 Field Preparation

4.3.1 PRIOR to beginning the performance of this procedure, OBTAIN work release from Shift Manager.

4.3.2 RECORD Allegro MX M&TE or Multi-Meter number and expiration date in the M&TE equipment log sheet.
5.0 PROCEDURE

Special Instructions

If any step is not required for procedure completion, record "N/A" in the applicable space(s) on the Data Sheet and document the justification in the Data Sheet’s comments/remarks section.

Work Steps in this procedure may be worked out of order as long as steps requiring a Lockout/Tagout are worked only while in a Locked Out/Tagged Out condition.

5.1 Inspect Cathodic Protection System Rectifiers

5.1.1 IF rectifier disconnecting means is in the off position, CONTACT FWS/System Engineer for resolution.

Special Instructions

Repairs/replacements may be made as long as it does not involve changes to configuration and actions taken are recorded in the Comments section of the Data Sheet and work package Work Record.

5.1.2 CHECK voltage from frame of rectifier to a known ground source prior to contacting rectifier frame.

   5.1.2.1 IF voltage from rectifier frame to known ground source is present, CONTACT FWS prior to continuing with this procedure.

5.1.3 USE caution when working in the rectifier panel and oil tub area to prevent possible electrical shock.

5.1.4 INSPECT rectifier for the following deficiencies AND RECORD findings on the Data Sheet:

   • Bad gasket
   • Exposed AC lines
   • Oil leak, including leak into meter compartment
   • Dirty oil
   • Tap setting board is dirty
   • Low Oil Level.
5.1 Inspect Cathodic Protection System Rectifiers (Cont.)

5.1.4.1 IF rectifier gasket needs to be replaced, REPLACE with new gasket.

5.1.4.2 IF any of the following conditions exist, ENSURE lock and tag is in place in accordance with DOE-0336, Hanford Site Lockout/Tagout Procedure AND REPAIR OR REPLACE them,
   • Exposed AC lines
   • Dirty oil
   • Tap setting board is dirty
   • Oil Level is low.

5.1.4.3 DOCUMENT any actions taken in the comment section of the Data Sheet and Work Record of the work package.

5.1.4.4 IF hung in Step 5.1.4.2, REMOVE lock and tag in accordance with DOE-0336, Hanford Site Lockout/Tagout Procedure.

5.1.4.5 IF any of the conditions in Step 5.1.4.2 cannot be immediately repaired, NOTIFY FWS/System Engineer to generate work package for tracking pending repair/replacement.

5.1.5 INSPECT for an oil leak AND DOCUMENT results on Step 1 on Data Sheet.

5.1.6 IF an oil leak is identified, NOTIFY Shift Manager AND CONTACT engineering for resolution.

5.1.6.1 IF corrective actions are performed, DOCUMENT corrective actions on the Comments section of the Data Sheet.

5.1.7 IF oil level is on or only slightly above the cold level fill line or oil level line for rectifier 47, CONTACT Engineering for evaluation of oil level and further direction.

5.1.8 IF Engineering determines oil level is okay, GO TO Step 5.1.9.
5.1 Inspect Cathodic Protection System Rectifiers (Cont.)

5.1.9 IF Engineering determines the oil level is too low, **PERFORM** the following:

5.1.9.1 **ENSURE** lock and tag is in place in accordance with DOE-0336, Hanford Site Lockout/Tagout Procedure.

5.1.9.2 **AS** directed by FWS, **PERFORM** corrective actions **AND** **RECORD** those directions on Comments page of Data Sheet or work record.

5.1.9.3 **INFORM** Engineering/FWS of existing and corrected conditions.

5.1.9.4 **REMOVE** lock and tag in accordance with DOE-0336, Hanford Site Lockout/Tagout Procedure.

5.1.10 **USE** caution when working in the rectifier panel and oil tub area to prevent possible electrical shock.

5.1.11 **USE** the Allegro MX Field PC **AND** **PERFORM** Steps 5.1.12 through 5.1.17.2.

**Special Instructions**

M&TE multimeter may be used as a substitute for the Allegro with engineering approval. If Approved, Engineering will provide PCS database Data Sheets for hand recording.

5.1.12 **RECORD** As-Found rectifier tap settings in Allegro MX Field PC.

5.1.13 **COMPARE** As-Found tap settings against required rectifier tap setting found on the Allegro unit **AND**

**IF** readings are different than expected, **CONTACT** FWS/ENG for resolution.

5.1.14 **MEASURE** DC voltage across rectifier output lugs (i.e. + anode to – structure) **AND**

**RECORD** in Allegro MX Field PC.

5.1.15 **COMPARE** measured DC voltage reading against the maximum and minimum DC output voltages detailed in the Allegro unit.
5.1 Inspect Cathodic Protection System Rectifiers (Cont.)

5.1.16 IF measured DC voltage reading is not within range, PERFORM the following:

5.1.16.1 NOTIFY FWS.

5.1.16.2 CONTACT System Engineer for direction.

5.1.16.3 PERFORM Lockout/Tagout in accordance with DOE-0336, Hanford Site Lockout/Tagout Procedure.

NOTE - DOE-0359, Hanford Site Electrical Safety Program is guidance for electrical safety practices.

5.1.16.4 USE caution when working in the rectifier panel and oil tub area to prevent possible electrical shock.

5.1.16.5 CHECK fuses in main fuse disconnect.

5.1.16.6 CHECK input circuit for broken or bad connections.

5.1.16.7 CHECK secondary fuses.

5.1.16.8 CHECK wires from secondary fuses to diode stack.

5.1.16.9 CHECK for bad diode stack.

5.1.16.10 ADJUST tap settings per engineering direction to obtain voltage values between the maximum and minimum DC output voltage values.

5.1.16.11 REMOVE Lockout/Tagout in accordance with DOE-0336, Hanford Site Lockout/Tagout Procedure.

5.1.16.12 IF tap settings were adjusted, ALLOW 24 hours prior to obtaining a new set of readings AND RECORD new values.

5.1.16.13 IF condition still exists, DOCUMENT in comments section AND

CONTACT FWS/ Engineer for resolution.
5.1 Inspect Cathodic Protection System Rectifiers (Cont.)

5.1.17 RECORD current output with millivolt shunt reading.

NOTE - For the Good-All rectifiers, the total output shunt can be identified as the one shunt with wires attached. The wires lead to the installed ammeter.

- The other shunts in the rectifier enclosure are installed directly above the connectors. The connectors are attached to the cables that lead to the structures and the anodes.

5.1.17.1 PLACE the Calibrated Allegro unit test leads on brass screws of the Total Output Shunt.

NOTE - The Allegro unit automatically calculates the current based on shunt values stored in the data logger.

5.1.17.2 MEASURE DC millivolts across total output shunt AND RECORD the calculated current.

5.1.17.3 REMOVE test leads.
5.2 Restoration

5.2.1 IF any problems were encountered with calibration, INFORM FWS.

5.2.2 ENSURE all test equipment has been disconnected/removed.

5.2.3 ENSURE Test Equipment information and calibration status are recorded on Data Sheet.

5.2.4 ENSURE equipment system restoration by observing indications are consistent with expected conditions.

5.2.5 NOTIFY Operations that testing is complete and system may be returned to desired configuration.

5.3 Acceptance Criteria

The condition for Acceptance Criteria of the Data Sheet, the PCS report and for the Data Sheet and report to be considered Satisfactorily Completed. The measured DC output voltage should be found or adjusted to be within the minimum and maximum range. If any condition still exists after performing Steps 5.1.1 thru 5.1.4.2 or any other failure or degradation is noted, a work package should be generated to correct the problem.

5.4 Review

5.4.1 INFORM FWS test is complete.

5.4.2 The FWS must REVIEW AND ENSURE the following:

- Provide a copy of the collected data on the Allegro unit
- Receive a copy of the PCS report from Engineering
- Completed Data Sheets and PCS report 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.
5.5 Records

The performance of this procedure generates no records. However, PM Data Sheets and PCS reports 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.