Collecting Measurements from Electrical Resistance Sensors Installed in Tank Farms Cathodic Protection System

Table of Contents

1.0 PURPOSE AND SCOPE........................................................................................................................................... 3
  1.1 Purpose............................................................................................................................................................. 3
  1.2 Scope............................................................................................................................................................... 3

2.0 INFORMATION......................................................................................................................................................... 3
  2.1 Terms and Definitions........................................................................................................................................... 3
  2.2 General Information............................................................................................................................................ 3

3.0 PRECAUTIONS AND LIMITATIONS.................................................................................................................... 4
  3.1 Personnel Safety.................................................................................................................................................. 4
  3.2 Radiation and Contamination Control.................................................................................................................. 4
  3.3 Environmental Compliance ............................................................................................................................... 4

4.0 PREREQUISITES ....................................................................................................................................................... 5
  4.1 Special Tools, Equipment and Supplies................................................................................................................ 5
  4.2 Performance Documents...................................................................................................................................... 5
  4.3 Field Preparation................................................................................................................................................ 5

5.0 PROCEDURE............................................................................................................................................................. 6
Collecting Measurements from Electrical Resistance Sensors Installed in Tank Farms Cathodic Protection System

5.1 Collect Cathodic Protection System ER Sensor Measurements ............................................. 6
5.2 Restoration .......................................................................................................................... 8
5.3 Acceptance Criteria ......................................................................................................... 8
5.4 Review .............................................................................................................................. 8
5.5 Records ............................................................................................................................ 9

Data Sheet 1 – ER Sensor Test Stations, AP-Farm ....................................................................... 10
Data Sheet 2 - ER Sensor Test Stations, AY-Farm ................................................................. 11
Data Sheet 3 - ER Sensor Test Stations, SY-Farm .................................................................... 12
Figure 1 – Electrical Resistance Test Station Enclosure Example Configuration ...................... 13
1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for collecting measurements from the Electrical Resistance (ER) sensors installed in select cathodic protection test stations.

This procedure can be performed in multiple locations. A work area and/or location specific hazard analysis must be performed prior to starting the activity per TFC-ESHQ-S_SAF-C-02.

1.2 Scope

This procedure applies to cathodic protection test stations with ER sensors installed. (See Data Sheet 1, Data Sheet 2, and Data Sheet 3) These sensors protect double shell tank piping required to be operational after June 30, 2005 as outlined in RPP-25299, IQRPE Assessment of Cathodic Protection for Post-2005 DST Pipelines, Rev. 1, (Table 1).

2.0 INFORMATION

2.1 Terms and Definitions

- ASME - American Society of Mechanical Engineers
- Checkmate - A registered trademark of Rohrback Cosasco System Inc, Santa Fe, California
- CORROSOMETER - A registered trademark of Rohrback Cosasco System Inc, Santa Fe, California
- ER - Electrical Resistance
- QC - Quality Control

2.2 General Information

Voltage and amperage measurements from the cathodic protection system test stations are collected in procedure, 3-CATH-690. This procedure only captures data from the ER sensors installed in select test stations. Trending for system performance is accomplished utilizing only data from procedure 3-CATH-690.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

When it is necessary to perform work on or in the vicinity of energized equipment, follow electrical safety practices as outlined in DOE–0359, Hanford Site Electrical Safety Program.

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

If working with Radiological or potentially Radiologically contaminated equipment, ensure a Pre-Job Rad survey is performed. If working on contaminated equipment, a Post-Job survey is required.
4.0 PREREQUISITES

4.1 Special Tools, Equipment and Supplies

The following supplies may be needed to perform this procedure:
• Checkmate™ CORROSOMETER®
• Other tools, equipment and supplies as identified by Shift Manager/OE/FWS/User.

4.2 Performance Documents

The following documents may be needed to perform this procedure:
• DOE–0359, Hanford Site Electrical Safety Program.

4.3 Field Preparation

4.3.1 ENSURE a work area and/or a location specific hazards analysis has been performed per TFC-ESHQ-S-SAF-C-02.

4.3.2 RECORD serial number of Checkmate™ CORROSOMETER® on Data Sheet 1, Data Sheet 2, and/or Data Sheet 3.
5.0 **PROCEDURE**

**Special Instructions**

If performance of any steps in this procedure is not required for procedure completion, steps not performed are to be marked, "N/A" in Data Sheet signoff space, and explained in comments/remarks section of Data Sheet.

5.1 **Collect Cathodic Protection System ER Sensor Measurements**

**NOTE** - Choosing a test station to collect data from can be done in any logical order at the discretion of the FWS and/or Engineer so long as data is collected from all the stations listed in Data Sheet 1, Data Sheet 2, and Data Sheet 3.

5.1.1 **CHOOSE** a test station.

**NOTE** - Once data collection has begun at a test station, all readings must be completed for that particular test station.

5.1.2 **POSITION** Checkmate™ CORROSOMETER® to ON.

5.1.3 **WAIT** for the instrument to self-check the batteries and for the display to show the time and date.

5.1.4 **CONNECT** the Checkmate™ CORROSOMETER® probe to the 6-pin connector. (See Figure 1 for an example.)

5.1.5 **PRESS** the READ (F1) soft key.

5.1.6 **PRESS** the Probe (F1) soft key.

5.1.7 **PRESS** the Quick (F2) soft key.

**NOTE** - After performing Step 5.1.8 the instrument will enter the measurement cycle indicated by scrolling across the bottom of the display.

- After 25 seconds or so it will display “Div:” and “Chk:”. The Div value is the metal loss in divisions (0-1000 divisions) and the Chk is the internal probe check value which should be between 750 and 850 divisions.

5.1.8 **PRESS** the D (F3) soft key **AND**

**WAIT UNTIL** the “Div:” and “Chk:” values scroll across the bottom of the screen.

5.1.8.1 **IF** the “Chk:” value is not between 750 to 850 divisions **NOTIFY** FWS.
5.1 Collect Cathodic Protection System ER Sensor Measurements (Cont.)

5.1.8.2 IF the “Div:” value is not between 0 to 1000 divisions NOTIFY FWS.

5.1.9 RECORD the Div: and Chk: values on Data Sheet 1, Data Sheet 2, or Data Sheet 3.

5.1.10 REPEAT Steps 5.1.2 through 5.1.9 UNTIL measurements have been obtained from all test stations in the enclosure THEN

GO TO Step 5.1.11.

5.1.11 PRESS the Exit (F4) soft key.

5.1.12 PRESS the OFF (red) key.

5.1.13 REPEAT Steps 5.1.1 through 5.1.12 UNTIL measurements have been obtained from all test stations listed on Data Sheet 1, Data Sheet 2, and Data Sheet 3.
5.2 Restoration

5.2.1 IF any problems were encountered, INFORM FWS and Engineering.

5.2.2 DISCONNECT AND REMOVE test equipment.

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

5.3 Acceptance Criteria

The Div value is the metal loss in divisions (0-1000 divisions).

The Chk value is the internal probe check value which should be between 750 and 850 divisions.

5.4 Review

5.4.1 INFORM FWS test is complete.

5.4.2 FWS REVIEW AND ENSURE the following:

- Data Sheets are complete
- Comments sections are filled out appropriately
- A copy of all Data Sheets is forwarded to system engineer for evaluation
- All copies of Data Sheets are in the Work Package, by comparing Test Station Label # on Group Data Sheets against the test stations
- 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, as applicable.
5.5 Records

This procedure is performed within a work package, as such, the procedure in its entirety will be maintained as a record per the Work Control process.

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.
# Collecting Measurements from Electrical Resistance Sensors Installed in Tank Farms Cathodic Protection System

## Data Sheet 1 – ER Sensor Test Stations, AP-Farm

<table>
<thead>
<tr>
<th>Test Station</th>
<th>Terminal Numbers</th>
<th>ER Sensor Measurements</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>(78-T5ER), Outside Fence West Side of AP Farm</td>
<td>6-pin Connector</td>
<td>Div (Divisions)</td>
<td>Chk (Divisions)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Probe 1</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Probe 2</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Probe 3</td>
<td>N/A</td>
</tr>
</tbody>
</table>

| (78-T6ER)                    | 6-pin Connector | Div (Divisions)     | Chk (Divisions) | N/A |
|                              |                  | Probe 1               | N/A             | N/A |
|                              |                  | Probe 2               | N/A             | N/A |
|                              |                  | Probe 3               | N/A             | N/A |

| (78-T7ER)                    | 6-pin Connector | Div (Divisions)     | Chk (Divisions) | N/A |
|                              |                  | Probe 1               | N/A             | N/A |
|                              |                  | Probe 2               | N/A             | N/A |
|                              |                  | Probe 3               | N/A             | N/A |

| (78-T8ER)                    | 6-pin Connector | Div (Divisions)     | Chk (Divisions) | N/A |
|                              |                  | Probe 1               | N/A             | N/A |
|                              |                  | Probe 2               | N/A             | N/A |
|                              |                  | Probe 3               | N/A             | N/A |
|                              |                  | Probe 4               | N/A             | N/A |

Checkmate™ CORROSOMETER®

Serial Number

<table>
<thead>
<tr>
<th>Signature</th>
<th>Print (First and Last)</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Electrician**
# Data Sheet 2 - ER Sensor Test Stations, AY-Farm

## ER SENSOR TEST STATION DATA SHEET

<table>
<thead>
<tr>
<th>Test Station</th>
<th>Terminal Numbers</th>
<th>ER Sensor Measurements</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>T(41-58ER) (E of T(41-5); W of T(41-7))</td>
<td>6-pin Connector</td>
<td>Div (Divisions)</td>
<td>Chk (Divisions)</td>
</tr>
<tr>
<td>Probe 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probe 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probe 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probe 4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Checkmate™ CORROSMETER®

Serial Number

____________________ / ___________________ / __________
Signature Print (First and Last) Date

Electrician
## Data Sheet 3 - ER Sensor Test Stations, SY-Farm

### ER SENSOR TEST STATION DATA SHEET

<table>
<thead>
<tr>
<th>Test Station</th>
<th>Terminal Numbers</th>
<th>ER Sensor Measurements</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>T(24-18ER) (IN T(24-9))</td>
<td>6-pin Connector</td>
<td>Div (Divisions) N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chk (Divisions) N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Probe 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Probe 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Probe 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Probe 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T(24-19ER) (IN T(24-9))</td>
<td>6-pin Connector</td>
<td>Div (Divisions) N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chk (Divisions) N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Probe 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Probe 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Probe 3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Checkmate™ CORROSMETER®
Serial Number

_______________________________ / __________________ / __________________
Signature Print (First and Last) Date
Electrician
Collecting Measurements from Electrical Resistance Sensors Installed in Tank Farms Cathodic Protection System

Figure 1 – Electrical Resistance Test Station Enclosure Example Configuration