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Title/Desc:

ATP FOR PROJECT W-430 SY TANK FARM CATHODIC
PROTECTION UPGRADE RECTIFIER NO 36

Pages: 33

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(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Approval Designator	Reason for Transmittal	Originator Disposition	Receiver Disposition
1	WHC-SD-W430-ATP-001		0	Acceptance Test Procedure, Project W-430, Rectifier #36	SQ	1	1	1

16. KEY		
Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D or N/A (see WHC-CM-3-5, Sec. 12.7)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)											
(G)	(H)	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	Reason	Disp.
1	1	Cog. Eng. JA Neely		12/18/95	R3-35						
1	1	Cog. Mgr. JB Witt		12-18-95	R3-35						
1	1	QA KL Jones		12/18/95	L4-93						
1	1	Safety WG Farley		12/18/95	S7-71						
		Env.									
1	1	WG Brown		12/18/95	T4-07						
1	1	JH Haberman		12/18/95	R1-30						

18. J. A. Neely Signature of EDT Originator Date 12/18/95	19. _____ Authorized Representative Date for Receiving Organization	20. JB Witt Cognizant Manager Date 12-18-95	21. DOE APPROVAL (if required) Ctrl. No. _____ <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/comments <input type="checkbox"/> Disapproved w/comments
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Acceptance Test Procedure for Project W-430, SY-Tank Farm Cathodic Protection Upgrade, Rectifier #36

J.A. Neely

Westinghouse Hanford Company, Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-87RL10930

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Abstract: This document is prepared to demonstrate that the cathodic protection system functions as intended by the design.

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Release Approval


Date



Release Stamp

Approved for Public Release

TEST TITLE Rectifier 36LOCATION 241-SY Tank Farm Outside of North FencePROJECT NUMBER W-430 WORK ORDER C01969PROJECT TITLE SY Tank Farm Cathodic Protection Upgrade

Prepared By
ICF Kaiser Hanford Company
Richland, Washington

For the U.S. Department of Energy
Contract DE-AC06-93RL12359

PROCEDURE APPROVAL

ICF Kaiser Hanford Company (ICF KH)

<u>Allyn R. Snowwhite</u> Author	<u>12-7-95</u> Date	<u>Robert B Hoffmann</u> Technical Documents	<u>12-7-95</u> Date
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<u>Wayne H. Farley</u> Safety	<u>12/14/95</u> Date	<u>MOB SY Cap Eng</u> <u>JJ Boudel</u> Operations	<u>12/14/95</u> Date

EXECUTION AND TEST APPROVAL

EXECUTED BY

Test Director/Organization Date Test Operator/Organization Date

Recorder/Organization Date

WITNESSES

Witness/Organization Date Title III Inspector Date

Witness/Organization Date Witness/Organization Date

A-E APPROVAL

ICF Kaiser Hanford Company (ICF KH)

Without exceptions _____ With exceptions resolved _____ With exceptions outstanding _____

Acceptance Inspection Date Design Engineer Date

Project Manager Date

TEST APPROVAL AND ACCEPTANCE

Westinghouse Hanford Company (WHC)

Without exceptions _____ With exceptions resolved _____ With exceptions outstanding _____

Projects Department Date Quality Assurance Date

Safety Date Cathodic Protection Engineer Date

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NOTE: At completion of test, enter pages added during performance of test to this Table of Contents.

1 PURPOSE

This Acceptance Test Procedure (ATP) has been prepared to demonstrate that the cathodic protection system functions as required by project criteria.

2 REFERENCES

2.1 DRAWINGS

H-2-91022, Sh 4, Rev 2	Cathodic Protection - Plot Plan, Test Stations, Jumpers, and Anodes
H-2-91023, Sh 7, Rev 2	Cathodic Protection - Plot Plan, Test Stations, Jumpers, and Anodes
H-2-91024, Sh 7, Rev 2	Cathodic Protection - Plot Plan, Test Stations, Jumpers, and Anodes
H-2-91044, Sh 1, Rev 6	Electrical - Cathodic Protection Installation Details
H-2-91044, Sh 2, 4 and 5, Rev 2	Electrical - Cathodic Protection Details
H-2-91044, Sh 6, Rev 1	Electrical - Cathodic Protection Misc Details
H-2-91045, Sh 1, Rev 7	Cathodic Protection - Installation Details
H-2-91050, Sh 2, Rev 4	Cathodic Protection - Traceability Drawings, Symbols and Notes

2.2 SPECIFICATIONS

W-430-C1	Construction Specification
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2.3 ENGINEERING CHANGE NOTICES (ECN)

Prior to final test approval, enter ECNs written against this ATP.

3 RESPONSIBILITIES

3.1 GENERAL

Each company or organization participating in this ATP will designate personnel to assume the responsibilities and duties as defined herein for their respective roles. The designees shall become familiar with this ATP and the systems involved to the extent that they can perform their assigned duties.

3.2 WHC PROJECT ENGINEER

3.2.1 Designates a Test Director.

3.2.2 Coordinates testing with the Tank Farm Manager.

- 3.2.3 Acts as liaison between the participants in acceptance testing.
- 3.2.4 Distributes the approved testing schedule before start of testing.
- 3.2.5 Schedules and conducts a pretest kickoff meeting with test participants when necessary.
- 3.2.6 Notifies the persons supporting the test 2 days before the start of testing.
- 3.2.7 Schedules a dry run when necessary.
- 3.2.8 Notifies concerned parties when a change is made in the testing schedule.
- 3.2.9 Signs Execution and Test Approval page when test is approved and accepted.
- 3.2.10 Takes necessary action to clear exceptions to the test.
- 3.2.11 Signs Exception Form when exception has been resolved.
- 3.2.12 Provides a distribution list for the approved and accepted ATP(ATR).

3.3 TEST DIRECTOR

- 3.3.1 Coordinates and directs acceptance testing.
- 3.3.2 Confirms that field testing and inspection of the system or portion of the system to be tested has been completed.
- 3.3.3 Stops any test which, in his or her judgment, may cause damage to the system until the problem has been resolved.
- 3.3.4 After verifying there is no adverse impact, may alter the sequence in which systems or subsystems are tested.
- 3.3.5 Ensures that required environmental conditions are maintained.
- 3.3.6 If a test is to be suspended for a period of time, ensures that the system is left in a safe mode.
- 3.3.7 Before restarting suspended test, re verifies the test prerequisites.
- 3.3.8 Initiates ECNs to document required changes to the ATP.
- 3.3.9 Reviews recorded data, discrepancies, and exceptions.
- 3.3.10 Obtains information or changes necessary to clear or resolve objections during the performance of the test.
- 3.3.11 Signs Execution and Test Approval page when test has been performed.
- 3.3.12 Signs Exception Form when exception has been resolved.

- 3.3.13 Obtains required signatures on the ATP Master prior to reproduction and distribution.
- 3.4 WITNESSES (Provided by Participating Organizations. One witness shall be a Title III acceptance inspector.)
 - 3.4.1 Witness the tests.
 - 3.4.2 Review results of testing.
 - 3.4.3 Assist the Test Director when requested.
 - 3.4.4 Sign Execution and Test Approval page when test has been performed.
 - 3.4.5 Sign Exception Form when exception has been resolved.
- 3.5 RECORDER (Provided by ICF KH)
 - 3.5.1 Prepares a Field copy from the ATP Master.
 - 3.5.2 Records names of all designated personnel on Field copy of ATP prior to start of testing.
 - 3.5.3 Records test instrument identification numbers and calibration expiration dates, as required.
 - 3.5.4 Initials and dates every test step on the Field copy as it is completed next to the step number or on a data sheet, when provided. Records test data. On data sheets where there is not room for both the initial and date, date may be entered at bottom of column.
 - 3.5.5 Records objections and exceptions on an Exception form. Uses additional Exception forms as needed. Notifies the Test Director at time the objection is made.
 - 3.5.6 Signs Execution and Test Approval page when test has been performed.
 - 3.5.7 After test is finished, assigns alpha numeric page numbers to added data sheets and Exception forms. Records page numbers in the Table of Contents.
 - 3.5.8 Transfers Field copy entries for each step to the Master in ink or type, signs, and dates. Transmits the completed Master to the Test Director for approval signature routing. Transmits the Field copy to Construction Document Control for inclusion in the official project file.
 - 3.5.9 Signs Exception Form when exception has been resolved and transmits to Test Director.

3.6 TEST OPERATOR

- 3.6.1 Performs test under direction of the Test Director.
- 3.6.2 Provides labor, equipment, and test instruments required for performing tests which have not been designated as being provided by others.
- 3.6.3 Requests in writing from the Test Director those services, materials, or equipment that have been designated as being supplied by others.
- 3.6.4 Confirms that all equipment required for performing test will be available at the start of testing.
- 3.6.5 Signs the Execution and Test Approval page.

3.7 A-E ACCEPTANCE INSPECTION, DESIGN ENGINEER, AND PROJECT MANAGER

- 3.7.1 Evaluate results.
- 3.7.2 Sign for A-E Approval on Execution and Test Approval page.

4 CHANGE CONTROL

Required changes to this ATP must be processed on ECNs in accordance with company procedures. If a need for change is discovered in the course of running the test, the test shall be stopped until the ECN is approved. However, this does not prevent the running of another portion of the test unaffected by the change.

5 EXECUTION

5.1 OCCUPATIONAL SAFETY AND HEALTH

Individuals shall carry out their assigned work in a safe manner to protect themselves and others from undue hazards and to prevent damage to property and environment. Facility line managers shall assure the safety of activities within their areas to prevent injury, property damage, or interruption of operation. Performance of test activities shall always include safety and health aspects.

5.2 PERFORMANCE

- 5.2.1 Conduct testing in accordance with ICF KH Procedure CON 3.5 (Performance and Recording of Acceptance Test Procedures).
- 5.2.2 Perform test following the steps and requirements of this procedure.

6 EXCEPTIONS

6.1 GENERAL

Exceptions to the required test results are sequentially numbered and recorded on individual Exception forms. This enables case-by-case resolution and approval of each exception.

Errors/exceptions in the ATP itself shall NOT be processed as test exceptions (see Section 4 CHANGE CONTROL).

6.2 RECORDING

6.2.1 Number each exception sequentially as it occurs and record it on an Exception Form (KEH-428), sample appended.

6.2.2 Enter name and organization of objecting party for each exception.

6.2.3 Enter planned action to resolve each exception when such determination is made.

6.3 RETEST/RESOLUTION

Record the action taken to resolve each exception. Action taken may not be the same as planned action.

6.3.1 When action taken results in an acceptable retest, sign and date Retest Execution and Acceptance section of the Exception Form.

6.3.2 When action taken does not involve an acceptable retest, strike out the Retest Execution and Acceptance section of the Exception Form.

6.4 APPROVAL AND ACCEPTANCE

The customer provides final approval and acceptance of exceptions by checking one of the following on Exception Form:

6.4.1 Retest Approved and Accepted: Applicable when Retest Execution and Acceptance section is completed.

6.4.2 Exception Accepted-As-Is: Requires detailed explanation.

6.4.3 Other: Requires detailed explanation.

The customer signs and dates the Exception Form and obtains other customer internal approvals, if required.

6.5 DISTRIBUTION

A copy of the approved Exception Form is distributed to each participant. The signed original is attached to the ATP Master.

7 PREREQUISITES, EQUIPMENT/INSTRUMENTS, AND ABBREVIATIONS

7.1 PREREQUISITES

The following conditions shall exist at start of testing for that portion of the system being tested.

- 7.1.1 The cathodic protection system has been inspected for compliance with construction documents.
- 7.1.2 Reference documents (including this ATP) have been verified for correct revision number and outstanding ECNs.
- 7.1.3 A Prejob Safety Analysis has been prepared and a Prejob Safety Meeting has been conducted.
- 7.1.4 Test instruments (except Waveform Analyzer) have a valid calibration stamp attached. Test instrument identification numbers and calibration expiration dates have been recorded in Para 7.2.

7.2 EQUIPMENT/INSTRUMENTS

Supplied by Test Operator unless otherwise noted.

- 7.2.1 Voltohmmeter (VOM): Digital, portable, 0-150 V ac/dc.
Instrument No. _____ Expiration Date _____
- 7.2.2 Waveform Analyzer: Hand held instrument with display of ON-OFF pipe-to-soil potential, DC potential or AC potential, MCMiller Co, Model WFA-1.
- 7.2.3 Test leads with insulated covers for wire clips.
- 7.2.4 Portable test reel, containing a minimum of 100 feet of test wire, 600 V, No. 18 AWG minimum.
- 7.2.5 Portable copper-copper sulphate reference electrode.
- 7.2.6 Pipe locator.

7.3 ABBREVIATIONS

- ECN Engineering Change Notice
- ENC Encasement

8 RECTIFIER, CABLES, PIPE TEST CONDUCTORS, NATIVE POTENTIALS, ANODES, AND SYSTEM OPERATION

8.1 The following steps will verify (1) rectifier nameplate data, (2) rectifier input wiring is correctly terminated and color coded, and (3) anode feeder cables, anode loop cables, anode lead cables and negative return cable are labeled and connected in accordance with the design.

8.1.1 Record Rectifier 36 nameplate data.

Make _____
Model _____
Serial Number _____
AC Line Input Voltage _____
AC Line Frequency _____
Number of Phases _____
DC Output Voltage _____
DC Output Current _____

8.1.2 Verify the following on rectifier:

8.1.2.1 Tank gasket is not damaged and is in place.

8.1.2.2 There are no loose electrical connections or frayed wires.

8.1.2.3 There are no oil leaks.

8.1.3 Verify rectifier disconnect switch is OPEN.

8.1.4 Using a VOM, verify no dc voltage at rectifier output terminals.

8.1.5 Verify rectifier case is filled with oil to the indicated level and that oil is CLEAR.

8.1.6 Verify ac wiring is terminated on ac input terminals of rectifier.

8.1.6.1 Line 1 (Red)

8.1.6.2 Line 2 (black)

8.1.6.3 Ground (Green)

8.1.7 Verify anode feeder cable and anode loop cable are terminated at rectifier positive terminal.

8.1.7.1 (+) FR36 (Anode Feeder Cable)

8.1.7.2 (+) LR36 (Anode Loop Cable)

- _____ 8.1.8 Verify negative return cable (-) R36 is connected to rectifier negative terminal.
- _____ 8.1.9 Verify rectifier case is connected to the ground rod.
- 8.2 The following steps will verify that all cables in each Anode Distribution Box are labeled and connected in accordance with the drawings and specification.
 - 8.2.1 Anode Distribution Box ADB(36-1)
 - _____ 8.2.1.1 (+) FR36 (Anode Feeder Cable)
 - _____ 8.2.1.2 (+) LR36 (Anode Loop Cable)
 - _____ 8.2.1.3 (+) FR36N (Anode Feeder Cable)
 - _____ 8.2.1.4 (+) LR36N (Anode Loop Cable)
 - _____ 8.2.1.5 (+) FR36S (Anode Feeder Cable)
 - _____ 8.2.1.6 (+) LR36S (Anode Feeder Cable)
 - _____ 8.2.1.7 A(36-21) (Anode Lead Cable)
 - _____ 8.2.1.8 A(36-22) (Anode Lead Cable)
 - _____ 8.2.1.9 A(36-23) (Anode Lead Cable)
 - _____ 8.2.1.10 A(36-24) (Anode Lead Cable)
 - _____ 8.2.1.11 A(36-25) (Anode Lead Cable)
 - _____ 8.2.1.12 A(36-26) (Anode Lead Cable)
 - _____ 8.2.1.13 A(36-27) (Anode Lead Cable)
 - _____ 8.2.1.14 A(36-28) (Anode Lead Cable)
 - _____ 8.2.1.15 A(36-29) (Anode Lead Cable)
 - _____ 8.2.1.16 A(36-30) (Anode Lead Cable)
 - _____ 8.2.1.17 A(36-31) (Anode Lead Cable)
 - _____ 8.2.1.18 A(36-32) (Anode Lead Cable)
 - _____ 8.2.1.19 A(36-33) (Anode Lead Cable)
 - _____ 8.2.1.20 A(36-34) (Anode Lead Cable)
 - _____ 8.2.1.21 A(36-35) (Anode Lead Cable)
 - _____ 8.2.1.22 A(36-36) (Anode Lead Cable)
 - _____ 8.2.1.23 A(36-37) (Anode Lead Cable)

- _____ 8.2.1.24 A(36-38) (Anode Lead Cable)
- _____ 8.2.1.25 A(36-39) (Anode Lead Cable)
- _____ 8.2.1.26 A(36-40) (Anode Lead Cable)
- _____ 8.2.1.27 A(36-41) (Anode Lead Cable)
- 8.2.2 Anode Distribution Box ADB(36-2)
- _____ 8.2.2.1 (+) FR36N (Anode Feeder Cable)
- _____ 8.2.2.2 (+) LR36N (Anode Loop Cable)
- _____ 8.2.2.3 A(36-1) (Anode Lead Cable)
- _____ 8.2.2.4 A(36-2) (Anode Lead Cable)
- _____ 8.2.2.5 A(36-3) (Anode Lead Cable)
- _____ 8.2.2.6 A(36-4) (Anode Lead Cable)
- _____ 8.2.2.7 A(36-5) (Anode Lead Cable)
- _____ 8.2.2.8 A(36-6) (Anode Lead Cable)
- _____ 8.2.2.9 A(36-7) (Anode Lead Cable)
- _____ 8.2.2.10 A(36-8) (Anode Lead Cable)
- _____ 8.2.2.11 A(36-9) (Anode Lead Cable)
- _____ 8.2.2.12 A(36-10) (Anode Lead Cable)
- _____ 8.2.2.13 A(36-11) (Anode Lead Cable)
- _____ 8.2.2.14 A(36-12) (Anode Lead Cable)
- _____ 8.2.2.15 A(36-13) (Anode Lead Cable)
- _____ 8.2.2.16 A(36-14) (Anode Lead Cable)
- _____ 8.2.2.17 A(36-15) (Anode Lead Cable)
- _____ 8.2.2.18 A(36-16) (Anode Lead Cable)
- _____ 8.2.2.19 A(36-17) (Anode Lead Cable)
- _____ 8.2.2.20 A(36-18) (Anode Lead Cable)
- _____ 8.2.2.21 A(36-19) (Anode Lead Cable)
- _____ 8.2.2.22 A(36-20) (Anode Lead Cable)

8.2.3 Anode Distribution Box ADB(36-3)

_____ 8.2.3.1 (+) FR36S (Anode Feeder Cable)

_____ 8.2.3.2 (+) LR36S (Anode Loop Cable)

_____ 8.2.3.3 A(36-42) Anode Lead Cable

_____ 8.2.3.4 A(36-43) Anode Lead Cable

_____ 8.2.3.5 A(36-44) Anode Lead Cable

_____ 8.2.3.6 A(36-45) Anode Lead Cable

_____ 8.2.3.7 A(36-46) Anode Lead Cable

_____ 8.2.3.8 A(36-47) Anode Lead Cable

_____ 8.2.3.9 A(36-48) Anode Lead Cable

_____ 8.2.3.10 A(36-49) Anode Lead Cable

_____ 8.2.3.11 A(36-50) Anode Lead Cable

_____ 8.2.3.12 A(36-51) Anode Lead Cable

_____ 8.2.3.13 A(36-52) Anode Lead Cable

_____ 8.2.3.14 A(36-53) Anode Lead Cable

_____ 8.2.3.15 A(36-54) Anode Lead Cable

_____ 8.2.3.16 A(36-55) Anode Lead Cable

_____ 8.2.3.17 A(36-56) Anode Lead Cable

_____ 8.2.3.18 A(36-57) Anode Lead Cable

_____ 8.2.3.19 A(36-58) Anode Lead Cable

_____ 8.2.3.20 A(36-59) Anode Lead Cable

8.3 The following steps will verify continuity of the anode feeder cables and the anode loop cables.

_____ 8.3.1 Record the Following VOM data:

Manufacturer _____
Model _____
Serial Number _____
Calibration Sticker Data _____

_____ 8.3.2 Disconnect all loop and feeder cables in Anode Distribution Box ADB(36-1).

8.3.3 Using the VOM, verify continuity across:

8.3.3.1 Anode Feeder Cable (+) FR36N and Anode Loop Cable (+) LR36N.

8.3.3.2 Anode Feeder Cable (+) FR36S and Anode Loop Cable (+) LR36S.

8.3.3.3 Anode Feeder Cable (+) FR36 and Anode Loop Cable (+) LR36.

8.3.4 Reconnect conductors that were disconnected in Step 8.3.2.

8.4 The following steps will verify pipe test conductors are: (1) terminated on designated terminals in accordance with the Drawings (2) labeled correctly with the pipe number or reference electrode and (3) marked with correct color tape in accordance with the Drawings and supplemental sketches: Red(R)-protected pipe, White(W)-protected pipe, Blue(BL)-unprotected pipe, Green(G)-reference electrode. (4) there is continuity between each set of pipe test conductors that are connected to the same pipe.

Record terminal number to which each conductor is connected. (Note conductor color shown in parenthesis.) Using a VOM, measure and record resistance between conductors connected to the same pipe. Resistance measured shall be less than 1 ohm.

8.4.1 Record the following VOM data:

Manufacturer _____
Model _____
Serial Number _____
Calibration Sticker Data _____

8.4.2 Test Station T(24-3)

3 inch DR-376/6 inch ENC Terminals _____ (BL) and
_____ (BL) _____ ohms

3 inch DR-377 Terminals _____ (BL) and
_____ (BL) _____ ohms

1-1/2 inch RW - M19 Terminals _____ (BL) and
_____ (BL) _____ ohms

2 inch SL-176/4 inch ENC Terminals _____ (BL) and
_____ (BL) _____ ohms

Reference Electrode No. 1 Terminal _____ (G)

Reference Electrode No. 2 Terminal _____ (G)

_____ 8.4.3	Test Station T(24-4)	Terminals_____ (R) and _____ (W)_____ ohms
	2 inch SL-175/4 inch ENC	
	3 inch SN-275/6 inch ENC	Terminals_____ (BL) and _____ (BL)_____ ohms
	3 inch SN-281/6 inch ENC	Terminals_____ (BL) and _____ (BL)_____ ohms
	1-1/2 inch FL	Terminals_____ (BL) and _____ (BL)_____ ohms
	Reference Electrode	Terminal _____ (G)
_____ 8.4.4	Test Station T(24-4A)	Terminals_____ (R) and _____ (W)_____ ohms
	2 inch SL-180/4 inch ENC	
	3 inch SN-280/6 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
	3 inch V562/6 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
	4 inch RW-M5	Terminals_____ (BL) and _____ (BL)_____ ohms
	Reference Electrode	Terminal _____ (G)
_____ 8.4.5	Test Station T(24-5)	Terminals_____ (R) and _____ (W)_____ ohms
	3 inch SN-285/6 inch ENC	
	3 inch SN-277/6 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
	2 inch SL-177/4 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms

1-1/2 inch FL	Terminals_____ (BL) and _____ (BL)_____ ohms
Reference Electrode No. 1	Terminal _____ (G)
Reference Electrode No. 2	Terminal _____ (G)
_____ 8.4.6 Test Station T(24-6)	
2 inch SL-175/4 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
3 inch DR-375/6 inch ENC	Terminals_____ (BL) and _____ (BL)_____ ohms
2 inch SL-176/4 inch ENC	Terminals_____ (BL) and _____ (BL)_____ ohms
1-1/2 inch S (100#) M2	Terminals_____ (BL) and _____ (BL)_____ ohms
1-1/2 inch RW - M19	Terminals_____ (BL) and _____ (BL)_____ ohms
1-1/2 inch S (100#) M2	Terminals_____ (BL) and _____ (BL)_____ ohms
Reference Electrode	Terminal _____ (G)
_____ 8.4.7 Test Station T(24-7)	
3 inch SN-282/6 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
3 inch SN-275/6 inch ENC	Terminals_____ (BL) and _____ (BL)_____ ohms
3 inch SN-276/6 inch ENC	Terminals_____ (BL) and _____ (BL)_____ ohms
3 inch SN-281/6 inch ENC	Terminals_____ (BL) and _____ (BL)_____ ohms

	2 inch DR-385	Terminals_____ (BL) and _____ (BL)_____ ohms
	1 inch IA-M7	Terminals_____ (BL) and _____ (BL)_____ ohms
	Reference Electrode	Terminal _____ (G)
_____	8.4.8 Test Station T(24-8)	
	3 inch SN-277/6 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
	2 inch SL-177/4 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
	Reference Electrode	Terminal _____ (G)
_____	8.4.9 Test Station T(24-9)	
	3 inch SN-285/6 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
	3 inch SN-286/6 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
	Reference Electrode	Terminal _____ (G)
_____	8.4.10 Test Station T(24-10)	
	3 inch V561/6 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
	2 inch SL-180/4 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
	3 inch SN-280/6 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
	3 inch SN-278/6 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
	1-1/2 inch FL-M35	Terminals_____ (BL) and _____ (BL)_____ ohms
	Reference Electrode	Terminal _____ (G)

_____ 8.4.11	Test Station T(24-11)	
	3 inch SN-279/6 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
	3 inch SN-286/6 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
	Reference Electrode	Terminal _____ (G)
_____ 8.4.12	Test Station T(24-12)	
	3 inch SN-282/6 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
	3 inch SN-276/6 inch ENC	Terminals_____ (BL) and _____ (BL)_____ ohms
	2 inch SL-176/4 inch ENC	Terminals_____ (BL) and _____ (BL)_____ ohms
	1-1/2 inch FL-M35	Terminals_____ (BL) and _____ (BL)_____ ohms
	Reference Electrode	Terminal _____ (G)
_____ 8.4.13	Test Station T(24-13)	
	3 inch SN-282/6 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
	3 inch V561/6 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
	3 inch V562/6 inch ENC	Terminals_____ (R) and _____ (W)_____ ohms
	3 inch SN-276/6 inch ENC	Terminals_____ (BL) and _____ (BL)_____ ohms
	Reference Electrode No. 1	Terminal _____ (G)
	Reference Electrode No. 2	Terminal _____ (G)

8.4.14 Test Station T(24-14)

2 inch SL-178/4 inch ENC

Terminals _____(R) and

_____ (W) _____ ohms

3 inch SN-278/6 inch ENC

Terminals _____(R) and

_____ (W) _____ ohms

Reference Electrode

Terminal _____ (G)

8.4.15 Test Station T(24-15)

2 inch SL-179/4 inch ENC

Terminals _____(R) and

_____ (W) _____ ohms

3 inch SN-279/6 inch ENC

Terminals _____(R) and

_____ (W) _____ ohms

Reference Electrode

Terminal _____ (G)

8.4.16 Test Station T(24-16)

3 inch V561-M25/6 inch ENC

Terminals _____(R) and

_____ (W) _____ ohms

3 inch V562-M25/6 inch ENC

Terminals _____(R) and

_____ (W) _____ ohms

Reference Electrode

Terminal _____ (G)

8.5 The following steps will provide the native potential of each protected pipe using both the permanent reference electrode and a portable reference electrode for comparison.

8.5.1 Open the input circuit breaker in existing Rectifier 25, located just south of the U Tank Farm, in Rectifier 26, located approximately 15 feet west of Rectifier 36 and in Rectifier 27, located near Catch Tank 241-S-302A. (Ref: Drawings H-2-91022, Sh 4, H-2-91023, Sh 7, and H-2-91024, Sh 7.)

NOTE: Connect the pipe test conductor to the positive terminal of the Wave Form Analyzer and the lead from the permanent or portable reference electrode to the common terminal of the Wave Form Analyzer. Turn the mode switch, on the Wave Form Analyzer, to the DC position. (Place the portable reference electrode directly above the pipe for those tests that require the use of the portable reference electrode).

8.5.2 Test Station T(24-4)

Permanent Reference Electrode and 2-inch
SL-175 w/4" ENC

Portable Reference Electrode and 2-inch
SL-175 w/4" ENC

8.5.3 Test Station T(24-4A)

Permanent Reference Electrode and 2-inch
SL-180 w/4" ENC

Portable Reference Electrode and 2-inch
SL-180 w/4" ENC

Permanent Reference Electrode and 3-inch
SN-280 w/6" ENC

Portable Reference Electrode and 3-inch
SN-280 w/6" ENC

Permanent Reference Electrode and 3-inch
V562 w/6" ENC

Portable Reference Electrode and 3-inch
V562 w/6" ENC

8.5.4 Test Station T(24-5)

Permanent Reference Electrode No. 2 and 3-inch
SN-285 w/6" ENC

Portable Reference Electrode and 3-inch
SN-285 w/6" ENC

Permanent Reference Electrode No. 2 and 3-inch
SN-277 w/6" ENC

Portable Reference Electrode and 3-inch
SN-277 w/6" ENC

Permanent Reference Electrode No. 1 and 2-inch
SL-177 w/4" ENC

Portable Reference Electrode and 2-inch
SL-177 w/4" ENC

8.5.5 Test Station T(24-6)

Permanent Reference Electrode and 2-inch
SL-175 w/4" ENC

Portable Reference Electrode and 2-inch
SL-175 w/4" ENC

8.5.6 Test Station T(24-7)

Permanent Reference Electrode and 3-inch
SN-282 w/6" ENC

Portable Reference Electrode and 3-inch
SN-282 w/6" ENC

8.5.7 Test Station T(24-8)

Permanent Reference Electrode and 3-inch
SN-277 w/6" ENC

Portable Reference Electrode and 3-inch
SN-277 w/6" ENC

Permanent Reference Electrode and 2-inch
SL-177 w/4" ENC

Portable Reference Electrode and 2-inch
SL-177 w/4" ENC

8.5.8 Test Station T(24-9)

Permanent Reference Electrode and 3-inch
SN-285 w/6" ENC

Portable Reference Electrode and 3-inch
SN-285 w/6" ENC

Permanent Reference Electrode and 3-inch
SN-286 w/6" ENC

Portable Reference Electrode and 3-inch
SN-286 w/6" ENC

8.5.9 Test Station T(24-10)

Permanent Reference Electrode and 3-inch
V561 w/6" ENC

Portable Reference Electrode and 3-inch
V561 w/6" ENC

Permanent Reference Electrode and 2-inch
SL-180 w/4" ENC

Portable Reference Electrode and 2-inch
SL-180 w/4" ENC

Permanent Reference Electrode and 3-inch
SN-280 w/6" ENC

Portable Reference Electrode and 3-inch
SN-280 w/6" ENC _____

Permanent Reference Electrode and 3-inch
SN-278 w/6" ENC _____

Portable Reference Electrode and 3-inch
SN-278 w/6" ENC _____

_____ 8.5.10 Test Station T(24-11)

Permanent Reference Electrode and 3-inch
SN-279 w/6" ENC _____

Portable Reference Electrode and 3-inch
SN-279 w/6" ENC _____

Permanent Reference Electrode and 3-inch
SN-286 w/6" ENC _____

Portable Reference Electrode and 3-inch
SN-286 w/6" ENC _____

_____ 8.5.11 Test Station T(24-12)

Permanent Reference Electrode and 3-inch
SN-282 w/6" ENC _____

Portable Reference Electrode and 3-inch
SN-282 w/6" ENC _____

_____ 8.5.12 Test Station T(24-13)

Permanent Reference Electrode No. 1 and 3-inch
SN-282 w/6" ENC _____

Portable Reference Electrode and 3-inch
SN-282 w/6" ENC _____

Permanent Reference Electrode No. 2 and 3-inch
V561 w/6" ENC _____

Portable Reference Electrode and 3-inch
V561 w/6" ENC _____

Permanent Reference Electrode No. 2 and 3-inch
V562 w/6" ENC _____

Portable Reference Electrode and 3-inch
V562 w/6" ENC _____

_____ 8.5.13	Test Station T(24-14)	
	Permanent Reference Electrode and 2-inch SL-178 w/4" ENC	_____
	Portable Reference Electrode and 2-inch SL-178 w/4" ENC	_____
	Permanent Reference Electrode and 3-inch SN-278 w/6" ENC	_____
	Portable Reference Electrode and 3-inch SN-278 w/6" ENC	_____
_____ 8.5.14	Test Station T(24-15)	
	Permanent Reference Electrode and 2-inch SL-179 w/4" ENC	_____
	Portable Reference Electrode and 2-inch SL-179 w/4" ENC	_____
	Permanent Reference Electrode and 3-inch SN-279 w/6" ENC	_____
	Portable Reference Electrode and 3-inch SN-279 w/6" ENC	_____
_____ 8.5.15	Test Station T(24-16)	
	Permanent Reference Electrode and 3-inch V561-M25 w/6" ENC	_____
	Portable Reference Electrode and 3-inch V561-M25 w/6" ENC	_____
	Permanent Reference Electrode and 3-inch V562-M25 w/6" ENC	_____
	Portable Reference Electrode and 3-inch V562-M25 w/6" ENC	_____

8.6 The following steps will verify proper operation of Rectifier 36.

- _____ 8.6.1 Verify rectifier input circuit breaker is OPEN.
- _____ 8.6.2 Verify all COARSE and FINE output transformer taps on rectifier are set at the lowest levels (Coarse - A and Fine - 1).
- _____ 8.6.3 At rectifier disconnect switch, record voltage across the following line side terminals:

Line 1 to Line 2 _____ volts

8.6.4 Verify proper rectifier polarity by use of the VOM. Close rectifier disconnect switch and input circuit breaker. Connect voltmeter positive lead to rectifier positive terminal and voltmeter negative lead to rectifier negative terminal and verify a POSITIVE voltage on VOM.

8.6.5 Record volts and amperes using meter(s) on rectifier. Open input circuit breaker. Set fine tap to next higher setting and leave coarse tap as previously set. Close input circuit breaker again. Record volts and amperes. Open input circuit breaker. Continue adjusting output of rectifier in steps until either the dc volts or dc amperes (whichever is first) approaches, but does not exceed, the nameplate rating of rectifier.

<u>Transformer Taps</u>		<u>dc Output</u>		<u>Transformer Taps</u>		<u>dc Output</u>	
<u>Coarse</u>	<u>Fine</u>	<u>Volts</u>	<u>Amps</u>	<u>Coarse</u>	<u>Fine</u>	<u>Volts</u>	<u>Amps</u>
A	1	_____	_____	C	1	_____	_____
A	2	_____	_____	C	2	_____	_____
A	3	_____	_____	C	3	_____	_____
A	4	_____	_____	C	4	_____	_____
A	5	_____	_____	C	5	_____	_____
B	1	_____	_____	D	1	_____	_____
B	2	_____	_____	D	2	_____	_____
B	3	_____	_____	D	3	_____	_____
B	4	_____	_____	D	4	_____	_____
B	5	_____	_____	D	5	_____	_____

8.6.6 Open rectifier input circuit breaker.

8.7 The following steps will verify proper operation of the anode ground bed system.

8.7.1 Record the following portable reference electrode data:

Manufacturer _____
 Model and type _____

8.7.2 Record the following VOM data:

Manufacturer _____
 Model _____
 Serial Number _____
 Calibration Sticker Data _____

- 8.7.3 Connect positive terminal of VOM to a protected pipeline test conductor (that is color coded with either red or white tape) through a portable test reel at various convenient test stations for the following procedure.
- 8.7.4 Connect negative terminal of the VOM to a portable copper-copper sulfate reference electrode.
- 8.7.5 Close rectifier input circuit breaker, place the portable reference electrode over each anode location, measure and record the potential using the VOM.

NOTE: A pipe locator may be used to locate anodes if necessary.

<u>Anode</u>	<u>Volts</u>	<u>Anode</u>	<u>Volts</u>
A(36-1)	_____	A(36-21)	_____
A(36-2)	_____	A(36-22)	_____
A(36-3)	_____	A(36-23)	_____
A(36-4)	_____	A(36-24)	_____
A(36-5)	_____	A(36-25)	_____
A(36-6)	_____	A(36-26)	_____
A(36-7)	_____	A(36-27)	_____
A(36-8)	_____	A(36-28)	_____
A(36-9)	_____	A(36-29)	_____
A(36-10)	_____	A(36-30)	_____
A(36-11)	_____	A(36-31)	_____
A(36-12)	_____	A(36-32)	_____
A(36-13)	_____	A(36-33)	_____
A(36-14)	_____	A(36-34)	_____
A(36-15)	_____	A(36-35)	_____
A(36-16)	_____	A(36-36)	_____
A(36-17)	_____	A(36-36)	_____
A(36-18)	_____	A(36-37)	_____
A(36-19)	_____	A(36-38)	_____
A(36-20)	_____	A(36-39)	_____

<u>Anode</u>	<u>Volts</u>	<u>Anode</u>	<u>Volts</u>
A(36-40)	_____	A(36-50)	_____
A(36-41)	_____	A(36-51)	_____
A(36-42)	_____	A(36-52)	_____
A(36-43)	_____	A(36-53)	_____
A(36-44)	_____	A(36-54)	_____
A(36-45)	_____	A(36-55)	_____
A(36-46)	_____	A(36-56)	_____
A(36-47)	_____	A(36-57)	_____
A(36-48)	_____	A(36-58)	_____
A(36-49)	_____	A(36-59)	_____

8.7.6 Open rectifier input circuit breaker and disconnect VOM and portable test reel.

8.8 The following steps will verify proper operation of the cathodic protection system:

8.8.1 Position the ten position DIP switch on the Pulse Generator (located in the rectifier control panel) as follows: SW1, 2, and 3 in the OFF position and SW4, 5, 6, 7, 8, 9, and 10 in the ON position.

8.8.2 Close Rectifier 36 input circuit breaker and the disconnect switch at the rectifier and verify the rectifier has been energized for 24 hours prior to the following test.

8.8.3 Measure and record the ON and OFF pipe-to-soil potential of each protected pipe by use of the Waveform Analyzer. For protected pipe the OFF values should be equal to or more negative than (-)0.85V dc or the ON values should be 100 mV more negative than the OFF values. If these values are not attainable by use of the permanent reference electrode a portable reference electrode may be used.

NOTE: Connect positive terminal of the Waveform Analyzer to the reference electrode terminal and the common terminal on the Waveform Analyzer to the pipe test conductor terminal. Turn the Mode switch from the OFF position to the WFA position, record values, then turn to the OFF position after each voltage measurement.

_____	8.8.3.1	Test Station T(24-4)		
		Reference Electrode and 2 inch SL-175/4 inch ENC	ON _____	OFF _____
_____	8.8.3.2	Test Station T(24-4A)		
		Reference Electrode and 2 inch SL-180/4 inch ENC	ON _____	OFF _____
		Reference Electrode and 3 inch SN-280/6 inch ENC	ON _____	OFF _____
		Reference Electrode and 3 inch V562/6 inch ENC	ON _____	OFF _____
_____	8.8.3.3	Test Station T(24-5)		
		Reference Electrode No. 1 and 2 inch SL-177/4 inch ENC	ON _____	OFF _____
		Reference Electrode No. 2 and 3 inch SN-285/6 inch ENC	ON _____	OFF _____
		Reference Electrode No. 2 and 3 inch SN-277/6 inch ENC	ON _____	OFF _____
_____	8.8.3.4	Test Station T(24-6)		
		Reference Electrode and 2 inch SL-175/4 inch ENC	ON _____	OFF _____
_____	8.8.3.5	Test Station T(24-7)		
		Reference Electrode and 3 inch SN-282/6 inch ENC	ON _____	OFF _____
_____	8.8.3.6	Test Station T(24-8)		
		Reference Electrode and 3 inch SN-277/6 inch ENC	ON _____	OFF _____
		Reference Electrode and 2 inch SL-177/4 inch ENC	ON _____	OFF _____
_____	8.8.3.7	Test Station T(24-9)		
		Reference Electrode and 3 inch SN-285/6 inch ENC	ON _____	OFF _____
		Reference Electrode and 3 inch SN-286/6 inch ENC	ON _____	OFF _____

_____ 8.8.3.8	Test Station T(24-10)		
	Reference Electrode and 3 inch V561/6 inch ENC	ON _____	OFF _____
	Reference Electrode and 2 inch SL-180/4 inch ENC	ON _____	OFF _____
	Reference Electrode and 3 inch SN-280/6 inch ENC	ON _____	OFF _____
	Reference Electrode and 3 inch SN-278/6 inch ENC	ON _____	OFF _____
_____ 8.8.3.9	Test Station T(24-11)		
	Reference Electrode and 3 inch SN-279/6 inch ENC	ON _____	OFF _____
	Reference Electrode and 3 inch SN-286/6 inch ENC	ON _____	OFF _____
_____ 8.8.3.10	Test Station T(24-12)		
	Reference Electrode and 3 inch SN-282/6 inch ENC	ON _____	OFF _____
_____ 8.8.3.11	Test Station T(24-13)		
	Reference Electrode No. 1 and 3 inch SN-282/6 inch ENC	ON _____	OFF _____
	Reference Electrode No. 2 and 3 inch V561/6 inch ENC	ON _____	OFF _____
	Reference Electrode No. 2 and 3 inch V562/6 inch ENC	ON _____	OFF _____
_____ 8.8.3.12	Test Station T(24-14)		
	Reference Electrode and 2 inch SL-178/4 inch ENC	ON _____	OFF _____
	Reference Electrode and 3 inch SN-278/6 inch ENC	ON _____	OFF _____
_____ 8.8.3.13	Test Station T(24-15)		
	Reference Electrode and 2 inch SL-179/4 inch ENC	ON _____	OFF _____
	Reference Electrode and 3 inch SN-279/6 inch ENC	ON _____	OFF _____

- _____ 8.8.3.14 Test Station T(24-16)
 - Reference Electrode and 3 inch V561-M25/6 inch ENC ON _____ OFF _____
 - Reference Electrode and 3 inch V562-M25/6 inch ENC ON _____ OFF _____
- _____ 8.8.4 Open rectifier input circuit breaker.
- _____ 8.8.5 Turn the Mode switch, on the Wave Form Analyzer, to the OFF position and disconnect leads.
- _____ 8.8.6 Open disconnect switch at the rectifier.
- _____ 8.8.7 Close the input circuit breaker on existing Rectifiers 25, 26, and 27 that was opened in previous step.
- _____ 8.8.8 Testing complete, secure from test.

END OF TEST

EXCEPTION NO.		Project No.	ATP No.	Rev.
Recorded by		Organization	Date Recorded	ATP Page No.
Step No.	Requirement			
Description of Problem				
Objector 1 (Name/Organization)			Objector 2 (Name/Organization)	
Planned Action				
Action Taken				
RETEST EXECUTION AND ACCEPTANCE				
Retest Installation Contractor	Date	Recorder	Date	
Witness 1 (Name/Organization)	Date	Witness 2 (Name/Organization)	Date	
Field Engineering	Date	Test Director (Name/Organization)	Date	
Design Engineering (Author of ATP)	Date	A-E Project Engineer	Date	
APPROVAL AND ACCEPTANCE – OPERATING CONTRACTOR				
<input type="checkbox"/> Retest Approved and Accepted		<input type="checkbox"/> Exception Accepted-as-is*		<input type="checkbox"/> Other*
* Explanation				
Approver 1		Date	Approver 2	Date
Approver 3		Date	Approver 4	Date

KEH-428 (6-85)