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ENGINEERING DATA TRANSMITTAL

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17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)										
(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date
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Acceptance Test Report For the AN Valve Pit Leak Detection and Low Point Drain Assembly Mock-up Test Procedure

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Fluor Daniel Northwest, Richland, WA 99352

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Abstract: This document describes The Performance Mock-up Test Procedure for the Valve Pit Leak Detection and Low Point Drain Assembly Performance Mock-Up Test Procedure.

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[Signature] 7/19/99
Release Approval Date

Approved for Public Release

Acceptance Test Report
For the
AN Valve Pit Leak Detection and Low Point Drain Assembly
Mock-up Test Procedure

Project W-314

Prepared by:	<u>Kenneth Ewer</u>	<u>6/16/99</u>
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Appendix A (attached field copy of Acceptance Test Procedure)

1.0 Introduction

The Performance Mock-up Test Procedure for the Valve Pit Leak Detection and Low Point Drain Assembly, TWR-4064 was conducted on May 11, 1999 through May 13, 1999. The test procedure was prepared by Fluor Daniel Northwest engineering and executed at the 277-A building in the 200 East area. The mock-up test was intended to validate the performance of the completed panel and drain seal assembly against project criteria listed in the section 2.1 of this report.

1.1 References

HNF-SD-W314-PDS-003, "Project Development Specification for Pit Leak Detection"

1.2 Abbreviations

ECN - Engineering Change Notice
EMI - Electromagnetic interference
HMI - Human-Machine Interface
MPS - Master Pump Shutdown
PDS - Project Development Specification
PLC - Programmable Logic Controller
TE - Test Exception

2.0 Description of test

The mock-up testing of this Leak Detector Relay Panel (ANB-WT-LDSTA-335) is representative of all such panels to be field installed on project W-314.

The test was initiated with circuit breaker and voltage verifications of the 120Vac power that was used to feed the leak detection relay panel. The MTL trip amplifier was adjusted to trip at 1.5Vdc or less probe voltage. Leak detector probe height above bottom of floor was set. Leak detector test for demonstrating time response, supervised circuit, power loss alarm, fail-safe output, PLC initiated operational testing and immunity to EMI were accomplished. Removable probes were demonstrated to be replaceable. Finally, leak detection function was demonstrated by immersing the probes in saltwater (The drain seal assembly was tested for leak through over a 24-hour duration).

2.1 Requirements

Requirements for the mock-up test are extracted from HNF-SD-W314-PDS-003.

- 2.1.1 PDS Requirement 3.2.1.1.3 - "Pit leak detection system shall be located a maximum of one inch above the floor in the lowest part in the pit or sump in the pit."
- 2.1.2 PDS Requirement 3.2.1.1.5 - "The required time response of the pit leak detection system shall be instantaneous. Instantaneous response time is defined as the time allowed for the leak detection system to produce an output signal after it has detected a leak. Based on definition in PDS, this time is less than or equal to one second."
- 2.1.3 PDS Requirement 3.2.1.1.6 - "The wiring between the leak detection system sensor and control panel shall be electrically supervised."
- 2.1.4 PDS Requirement 3.2.1.2.1 - "Loss of power to the leak detection system, shall provide an output signal to the local alarm and MPS."
- 2.1.5 PDS Requirement 3.2.1.2.2 - "A detected failure in the leak detection system shall provide an output signal to the local alarm and MPS system."
- 2.1.6 PDS Requirement 3.2.1.2.3 - "The leak detection system shall perform an operational test of itself when commanded by the MPS system. The test shall cover alarms, circuitry, and sensors of the leak detection system."
- 2.1.7 PDS Requirement 3.2.1.3.2 - "The reset/acknowledgement of the local alarm shall be either from an MPS system Human-Machine Interface of the local leak detection relay panel."
- 2.1.8 PDS Requirement 3.2.2.2 - "The portion of the pit leak detection system within the pit shall be replaceable without removing the pit cover block."
- 2.1.9 PDS Requirement 3.2.1.1.1 - "The pit leak detection system shall detect the presence of a leak within twenty-four hours."
- 2.1.10 PDS Requirement 3.2.1.1.2 - "The pit leak detection shall monitor for liquids during a waste transfer and shall provide a signal when a leak is detected."
- 2.1.11 PDS Requirement 3.2.1.3.3 - " The local alarm shall operate as follows:
- Immediately upon detecting a leak or malfunction, the local alarm shall flash and produce an audible alarm.
 - After the local alarm is acknowledged by an operator located at either the MPS System HMI or the local alarm cabinet, the local alarm shall remain flashing until recovery occurs.

- After the alarm is acknowledged at the MPS System HMI, the audible signal shall be silenced.
(audible operation is not in the scope of this mock-up test)
- When recovery occurs (the leak or malfunction has been corrected) and after the local alarm is acknowledged, the local alarm shall cease illuminating."

2.1.12 PDS Requirement 3.2.4.4 - "The pit leak detection system probe assembly that is located within the pits shall be testable in place with the addition of water into the pit."

2.1.13 PDS Requirement 3.3.2.1 - "Hand held radio and cell phone wattage shall not interfere with leak detection components at a distance of one meter."

3.0 Test results

The Performance Mock-up Test resulted in satisfactory performance against all PDS requirements, except for that of PDS Requirement 3.2.1.1.5, time response requirement. An exception was noted and designated as TE #1. TE #1 applies to Step number 5.5. (reference Performance Mock-up Test Procedure at Appendix A)

3.1 PDS Requirement 3.2.1.1.3 was satisfied by demonstration and completion of step number 5.4. (reference Performance Mock-up Test Procedure at Appendix A)

3.2 PDS Requirement 3.2.1.1.5 was *not* satisfied by demonstration of step number 5.5. An engineering calculation was prepared to verify by analysis rather than by demonstration.

3.3 PDS Requirement 3.2.1.1.6 was satisfied by demonstration and completion of step number 5.6. (reference Performance Mock-up Test Procedure at Appendix A)

3.4 PDS Requirement 3.2.1.2.1 was satisfied by demonstration and completion of step number 5.7. (reference Performance Mock-up Test Procedure at Appendix A)

3.5 PDS Requirement 3.2.1.2.2 was satisfied by demonstration and completion of step number 5.8. (reference Performance Mock-up Test Procedure at Appendix A)

3.6 PDS Requirement 3.2.1.2.3 was satisfied by demonstration and completion of step number 5.9. (reference Performance Mock-up Test Procedure at Appendix A)

3.7 PDS Requirement 3.2.1.3.9 was satisfied by demonstration and completion of step number 5.4. (reference Performance Mock-up Test Procedure at Appendix A)

- 3.8 PDS Requirement 3.2.2.2 was satisfied by demonstration and completion of step number 5.10. (reference Performance Mock-up Test Procedure at Appendix A)
- 3.9 PDS Requirement 3.2.1.1.1 was satisfied by demonstration and completion of step number 5.11. (reference Performance Mock-up Test Procedure at Appendix A)
- 3.10 PDS Requirement 3.2.1.1.2 was satisfied by demonstration and completion of step number 5.11. (reference Performance Mock-up Test Procedure at Appendix A)
- 3.10.1 PDS Requirement 3.2.1.3.3 was satisfied by demonstration and completion of step number 5.11. (reference Performance Mock-up Test Procedure at Appendix A)
- 3.11 PDS Requirement 3.2.4.4 was satisfied by demonstration and completion of step number 5.11. (reference Performance Mock-up Test Procedure at Appendix A)
- 3.12 PDS Requirement 3.3.2.1 was satisfied by demonstration and completion of step number 5.12. (reference Performance Mock-up Test Procedure at Appendix A)
- 4.0 Conclusions and Recommendations
 - 4.1 Relay chatter occurred when testing leak detector function with water. Water type, potable, shop or raw water, had little significance. Relay chatter ceased when test of leak detector functions was conducted with saltwater. The salt to water concentration created a solution having similar conductivity to the AN tank farm waste.
 - 4.2 The conclusion for this report is that the Valve Pit Leak Detection system and Low Point Drain Assembly performed adequately against given criteria (reference HNF-SD-W314-PDS-003) and shall be accepted as-is.

Appendix A

ENGINEERING CHANGE NOTICE

Page 1 of 31. ECN 653175
Proj. ECN W-314-4C-103

2. ECN Category (mark one)		3. Originator's Name, Organization, MSIN, and Telephone No.		4. USQ Required?	5. Date
Supplemental ☒		Richard T. Carratt, FDNW, G3-12, 372-3726		☐ Yes ☒ No	5/13/99
Direct Revision ☐		6. Project Title/No./Work Order No.		See note in block 13a	
Change ECN ☐		W-314, Tank Farm Restoration and Safe Operations		7. Bldg./Sys./Fac. No.	8. Approval Designator
Temporary ☐				200East Tank Farms	GS/SQE
Standby ☐		9. Document Numbers Changed by this ECN (includes sheet no. and rev.)		10. Related ECN No(s).	11. Related PO No.
Supersedure ☐		TWR-4064, Rev. 1		N/A	N/A
Cancel/Void ☐					
12a. Modification Work		12b. Work Package No.	12c. Modification Work Completed		12d. Restored to Original Condition (Temp. or Standby ECNs only)
☐ Yes (fill out Blk. 12b)		N/A	N/A		N/A
☒ No (NA Blks. 12b, 12c, 12d)			Design Authority/Cog. Engineer Signature & Date		Design Authority/Cog. Engineer Signature & Date
13a. Description of Change					
13b. Design Baseline Document? ☐ Yes ☒ No					
<p>1. DELETE Section 5.5 in its entirety.</p> <p>2. Revise Section 5.7.15 as follows:</p> <p>5.7.15 OPEN switch S1, VERIFY that 24 volt dc between external terminal blocks 19 and 20, shown as DVM2 on Fig. 5.11.1, is NOT present; and repeat steps 5.7.11 through 5.7.14 except RE-CLOSE switch S1 in step 5.7.12. Step 5.7.15 simulates a power failure to LDK-331.</p> <p>3. Revise Section 5.7.16 as follows:</p> <p>5.7.16 OPEN switch S3, VERIFY that 24 volt dc between external terminal blocks 19 and 20, shown as DVM2 on Fig. 5.11.1, is NOT present; and repeat steps 5.7.11 through 5.7.12 except RE-CLOSE switch S3 in step 5.7.12. Step 5.7.16 simulates a power failure to 24 Vdc power supply PS-331.</p> <p>NOTE (From block 4): USQ NOT REQUIRED. The document being changed is outside the requirements of USQ procedure HNF-IP-0842, VOLUME IV, section 5.4, rev 11. DEC 5/17/99</p>					
14a. Justification (mark one)		14b. Justification Details			
Criteria Change ☒		It is anticipated that Demo reqmt for sect. 3.2.1.1.5 on Quality			
Design Improvement ☐		Conformance Inspection Matrix Table 4-1 in PDS, HNF-SD-W314-PDS-003, will			
Environmental ☐		be deleted since the pit Leak Det. response time is easily verified by			
Facility Deactivation ☐		analysis with vendor info. Therefore, step 5.5 is not required. Typo			
As-Found ☐		errors in Sect. 5.7.15 & 5.7.16 were corrected. This modification will			
Facilitate Const. ☐		not change the collective dose since it has no impact on radiological			
Const. Error/Omission ☐		sources, contamination control, or shielding. This ECN does not affect			
Design Error/Omission ☐		the AN RVR or the AN-STEP. The design verification method is by informal			
		review. Documentation is accomplished by approval signatures on this ECN.			
15. Distribution (include name, MSIN, and no. of copies)					RELEASE STAMP
See attached Distribution sheet.					<p>DATE: <u>4</u></p> <p>STA: <u>4</u></p> <p>MAY 19 1999</p> <p>HANFORD RELEASE</p> <p>ID: <u>2.</u></p>

ENGINEERING CHANGE NOTICE

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1. ECN (use no. from pg. 1)

W-314-4C-103

16. Design Verification Required

☒ Yes☒ No *DEB*
5/17/99

17. Cost Impact

ENGINEERING

Additional ☒ \$ 200Savings ☐ \$

CONSTRUCTION

Additional ☐ \$ *N/A*Savings ☐ \$

18. Schedule Impact (days)

Improvement ☐ *N/A*Delay ☐

19. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 13. Enter the affected document number in Block 20.

SDD/DD ☐Functional Design Criteria ☐Operating Specification ☐Criticality Specification ☐Conceptual Design Report ☐Equipment Spec. ☐Const. Spec. ☐Procurement Spec. ☐Vendor Information ☐OM Manual ☐FSAR/SAR ☐Safety Equipment List ☐Radiation Work Permit ☐Environmental Impact Statement ☐Environmental Report ☐Environmental Permit ☐Seismic/Stress Analysis ☐Stress/Design Report ☐Interface Control Drawing ☐Calibration Procedure ☐Installation Procedure ☐Maintenance Procedure ☐Engineering Procedure ☐Operating Instruction ☐Operating Procedure ☐Operational Safety Requirement ☐IEFD Drawing ☐Cell Arrangement Drawing ☐Essential Material Specification ☐Fac. Proc. Samp. Schedule ☐Inspection Plan ☐Inventory Adjustment Request ☐Tank Calibration Manual ☐Health Physics Procedure ☐Spares Multiple Unit Listing ☐Test Procedures/Specification ☐Component Index ☐ASME Coded Item ☐Human Factor Consideration ☐Computer Software ☐Electric Circuit Schedule ☐ICRS Procedure ☐Process Control Manual/Plan ☐Process Flow Chart ☐Purchase Requisition ☐Tickler File ☐*HNF-SD-W314-PDS003* ☒

20. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision

N/A

Document Number/Revision

N/A

Document Number/Revision

N/A

21. Approvals

Signature

Date

Design Authority

D.E. Bowers

5/17/99

Design Agent

Signature

Date

PE

QA

Safety

Design

Environ.

Other

1995 Eng.

PROJ Mgr.

QA

Safety

Environ.

Other

Radcon

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5-19-99

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5/18/99

THOMAS

5/17/99

OPS

5/19/99

Robert Elder

5/17/99

PE

5/13/99

PE

25-13-99

QA

5/13/99

Safety

N/A

Design

5/3/99

Environ.

N/A

Other

5/17/99

DEPARTMENT OF ENERGY

Signature or a Control Number that tracks the Approval Signature

ADDITIONAL

EXPIRES 8-3-99

PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

SYSTEM

AN TANK FARM VALVE PITS

241-AN-A & AN-B VALVE PIT LEAK DETECTION AND LOW POINT DRAIN ASSEMBLY PERFORMANCE MOCK- UP TEST PROCEDURE

Prepared by: Richard T. Carratt
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5/4/99
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Date

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Henry M. Chafin, QA Lead, FDNW

5-4-99
Date

Concurrence: Tim W. Bohan
Tim W. Bohan, Operations, LMHC

5/4/99
Date

Concurrence: C. C. Scaief III
C. C. Scaief, III, Cognizant Engineer, LMHC

5-4-99
Date

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DOCUMENT TITLE: <div style="text-align: center;">241-AN-A VALVE PIT TRANSFER VALVES</div>		
TEST PERSONNEL (PRINT NAMES)		
TEST DIRECTOR: <div style="text-align: center;">KENNETH EWER</div>	FDNW PROJECT ENGINEER: <div style="text-align: center;">MICHAEL A. LAWE</div>	
QC: <div style="text-align: center;">W.P. VANFLET</div>	RECORDER: <div style="text-align: center;">W.P. VANFLET</div>	
ELECTRICIAN: <div style="text-align: center;">JIMMER STRINGER 5-13-99</div>		
TEST EXECUTION		
TEST DIRECTOR SIGNATURE/DATE: <div style="text-align: center;">Kenneth Ewer 5/11/99</div>	FDNW PROJECT ENGINEER SIGNATURE/DATE: <div style="text-align: center;">[Signature] 05-11-99</div>	
QC SIGNATURE/DATE: <div style="text-align: center;">W.P. Vanflet 5/11/99</div>	RECORDER SIGNATURE/DATE: <div style="text-align: center;">W.P. Vanflet 5-11-99</div>	
ELECTRICIAN SIGNATURE/DATE: <div style="text-align: center;">[Signature] 5-13-99</div>		
APPROVAL AND ACCEPTANCE OF TEST RESULTS		
WITHOUT EXCEPTION ____ (✓)	WITH EXCEPTIONS RESOLVED ✓ (✓)	WITH EXCEPTIONS REMAINING ____ (✓)
TEST DIRECTOR SIGNATURE/DATE: <div style="text-align: center;">Kenneth Ewer 6/1/99</div>	NHC PROJECT MANAGER SIGNATURE/DATE: <div style="text-align: center;">Dick M. Green FOR J.L. HOMAN 6-01-99</div>	
FDNW PROJECT MANAGER SIGNATURE/DATE: <div style="text-align: center;">[Signature] 06-01-99</div>	QUALITY ASSURANCE SIGNATURE/DATE: <div style="text-align: center;">Hank M. Chapin 06-01-99</div>	
ACCEPTANCE INSPECTOR SIGNATURE/DATE: <div style="text-align: center;">E. Enloe 6/1/99</div>	COINJANT ENGINEER SIGNATURE/DATE: <div style="text-align: center;">C.P. Sullivan 6-2-99</div>	
OPERATIONS SIGNATURE/DATE: <div style="text-align: center;">TW/Johnson 6/1/99</div>		

PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

1.0 PURPOSE AND SCOPE

1.1 PURPOSE

The purpose of this Procedure is to assist construction in the pre-operational fabrication and testing of the pit leak detection system and the low point drain assembly by:

- Control system testing of the pit leak detection system will be accomplished by actuating control switches and verifying that the control signal is initiated, liquid testing and overall operational requirements stated in HNF-SD-W314-PDS-003, "Project Development Specification for Pit Leak Detection".
- Testing of the low point floor drain assembly by opening and closing the drain to and from the "retracted" and "sealed" positions. Successful operation of this drain will be to verify that the seal does not leak on the "sealed" position, the assembly holds liquid until the leak detector actuates and the assembly will operate from on top of the mock-up cover block.

1.2 SCOPE

This Performance Mock-Up Test Procedure will test the following:

- Leak Detection Design for 241-AN-A and 241-AN-B Valve Pits
- Low Point Drain Assembly Design for 241-AN-A and 241-AN-B Valve Pits

2.0 INFORMATION

2.1 TERMS AND DEFINITIONS

2.1.1 PMTP - Performance Mock-Up Test Procedure

2.1.2 FDNW - Fluor Daniel Northwest

2.1.3 LMHC - Lockheed Martin Hanford Company

2.1.4 PDS - Project Design Specification

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

2.2 RESPONSIBILITIES

2.2.1 Each company or organization participating in the conduct of this procedure will designate personnel to assume the responsibilities and duties as defined herein for their respective roles. The names of these designees shall be provided to the Recorder for listing on the Working Copy of the Test Execution Sheet prior to the performance of any part of this procedure.

2.2.2 The FDNW Project Engineer is responsible for the following:

- Designation of a test director
- Acting as liaison between the participants in acceptance testing
- Distributing the approved testing schedule as soon as possible, but at least two days prior to testing
- Ensuring field testing and inspection has been completed
- Scheduling and conducting a pre-test meeting with acceptance test participants prior to start of testing
- Notification of the persons performing and witnessing the test prior to the start of testing
- Notification of all concerned parties when a change is made in the testing schedule
- Signing the Test Execution Sheet when the Performance Mock-Up Test Procedure is approved and accepted
- Taking necessary actions to clear exceptions to the Performance Mock-Up Test Procedure
- Signing the PMTP Exception Record when a test exception has been resolved

2.2.3 The Test Director is responsible for the following:

- Coordination of all acceptance testing
- Confirming that field testing and inspection of the system or portion of the system to be tested has been completed

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

- Stopping any test which may cause damage to the system until the Performance Mock-Up Test Procedure has been revised.
- Approving field changes to the Performance Mock-Up Test Procedure in accordance with steps 2.5.2 and 2.5.5
- Obtaining revisions to the Performance Mock-Up Test Procedure, as necessary, to comply with authorized field changes or to accommodate existing field conditions in accordance with steps 2.5.2 and 2.5.5
- Evaluating recorded data, discrepancies, and exceptions
- Obtaining from the NHC Project Engineer any information or changes necessary to clear or resolve objections
- Signing Test Execution Sheet when this Performance Mock-Up Test Procedure has been performed
- Signing PMTP Exception Record when a retest to clear an exception has been executed and accepted
- Obtaining required signatures on the Performance Mock-Up Test Procedure Working Copy prior to reproduction and distribution
- Ensuring and verifying that all prerequisite steps are completed correctly by signing where indicated at the end of Section 4 before initiating any individual Test Procedure
- Ensuring and verifying that steps in each individual Test Procedure in Section 5.0 are completed correctly by signing where indicated at the end of each Test Procedure
- Ensuring that safe work boundaries are established for testing.

2.2.4 The Recorder is responsible for the following:

- Performing all recording duties using black ink
- Recording the names of all designated personnel on the Working Copy of this procedure prior to start of testing
- Observing tests, recording test data, and maintaining the PMTP Performance Log

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- Signing the Test Execution Sheet as the Recorder
- Checking off or marking as "N/A" each substep as it is performed during each individual Test Procedure
- Initialing every test verification step requiring initials on the Working Copy of this Performance Mock-Up Test Procedure as that step is successfully performed, to indicate that Acceptance Criterion has been met
- Recording authorized field changes to this Performance Mock-Up Test Procedure
- Recording Test Exceptions and individual Test Procedure steps that are not performed satisfactorily on the PMTP Exception Record and ensuring that the information is transferred (in ink or typed) to master Working Copy PMTP Exception Record(s). Additional PMTP Exception Records are to be added as needed
- Orally notifying the Test Director at the time any objection is made during performance of the Performance Mock-Up Test Procedure
- Submitting the completed master Working Copy of this Performance Mock-Up Test Procedure to the Test Director for approval signatures and distribution.

2.2.5 The Construction Representative is responsible for the following.

- Organizing and performing this Performance Mock-Up Test Procedure under coordination of the Test Director
- Confirming that all equipment required for performing this Performance Mock-Up Test Procedure listed in Section 4.1 will be available at the start of testing
- Providing equipment required for performing this acceptance test which has not been designated as being provided by others
- Requesting in writing from the Project Engineer those services, materials, or equipment that have been designated as being supplied by the Department of Energy or others.

2.2.6 FDNW Quality Control is responsible for the following:

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- Verifying that all prerequisite steps are completed correctly by signing where indicated at the end of Section 4 before initiating any individual Test Procedure
- Verifying that steps in each individual Test Procedure in Section 5.0 are completed correctly by signing where indicated at the end of each Test Procedure.

2.2.7 FDNW Quality Engineering is responsible for the following:

- Reviewing and Approving the PMTP.
- Performing a post-test review of Performance Mock-up Test Documentation.
- Review and Approval of all PMTP Test Exceptions noted on the PMTP Exception Record.

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2.2.8 All personnel involved in procedure performance, data recording, and verification or evaluation of test steps shall provide name, title, signature, and initials in the following table.

NAME (PRINT)	TITLE	SIGNATURE	INITIAL
KENNETH EWER	Test Director	<i>Kenneth Ewer</i>	KLE
<i>W.P. VanFelt</i>	Recorder	<i>W.P. VanFelt</i>	P
DICK CARRATT	Witness	<i>D. Carratt</i>	RTC
	Witness		
	Witness		
<i>Michael A. Lane</i>	FDNW Project Engineer	<i>W.R. Swift</i>	<i>W.R. Swift</i>
<i>James J. Jones</i>	Construction Representative	<i>James J. Jones</i>	JJ
<i>W.P. VanFelt</i>	FDNW Quality Control	<i>W.P. VanFelt</i>	VP
JEFF MIDDLETON	FDNW Quality Engineering	<i>Jeff M. Chafin</i>	JWM
HANK M. CHAFIN		<i>Hank M. Chafin</i>	HMC
C.C. SCARLET III	Cognizant Engineer	<i>C.C. Scarlet III</i>	CCS
JE Andrews	Operations	<i>JE Andrews</i>	JEA

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2.3 RECORDS

- 2.3.1 The completed master "Working Copy" of this Performance Mock-Up Test Procedure, the completed "Test Execution Sheet", the completed "PMTP Performance Log" and "PMTP Exception Log", and all "Test Exception Sheets" generated during performance of this Performance Mock-Up Test Procedure will be kept as permanent records.

2.4 REFERENCES

- 2.4.1 The following documents were used to write or are referenced in this procedure:

- H-14-100941, "P & ID VALVE PIT 241-AN-A"
- H-14-100944, "JUMPER ARRANGEMENT VALVE PIT 241-AN-A"
- ECN-4C-027
- H-14-100969, "PIT COVER PAINTING DIAGRAM 241-AN-A"
- H-14-100978, sheet 1, "PIPING FLOOR DRAIN SEAL" ASSEMBLY VALVE PITS 241-AN-A&B"
- ECN-W314-4C-037
- H-14-100981, sheets 1 & 2, "INSTM Pit Leak Detector Assy Tank Farms"
- ECN-4C-006 & 007
- H-14-100983, sheet 1, "INSTM LEAK DETECTION RELAY PANEL ASSY & DETAILS"
- ECN-W314-4C-026, 041, 052
- H-14-100984, sheet 1, "INSTM PLAN AN FARM 241-AN-A & 241-AN-B"
- ECN-4C-018 & 025
- H-14-100985, sheet 1, "INSTM 241-AN-A VALVE PIT ELEVATION & DETAILS"

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

- H-14-100986, sheet 1, "INSTM 241-AN-B VALVE PIT ELEVATION & DETAILS"
- H-14-100989, sheet 1, "INSTM VALVE PIT LEAK DETECTION LDE-331 LOOP DIAGRAM"
- H-14-100989, sheet 2, "INSTM VALVE PIT LEAK DETECTION LDE-231 LOOP DIAGRAM"
- W314-C1, CONSTRUCTION SPECIFICATION

2.5 GENERAL INFORMATION

- 2.5.1 All steps in this Performance Mock-Up Test Procedure are performed at the (site of the Mock-up).
- 2.5.2 Performance Mock-Up testing is to be conducted in accordance with the steps and requirements specified in this procedure. Any required changes must be authorized in accordance with approved change control procedures.
- 2.5.3 ACCEPTANCE CRITERIA: All Test Procedure steps using the word **VERIFY** are considered Acceptance Criteria steps, and each must have successful execution indicated by having initials and the date entered in the provided space to be considered complete.
- 2.5.4 All entries recorded in this procedure shall be made in black ink, except for those noted using the redline method.
- 2.5.5 Required editorial changes to this procedure may be made by the Test Director and Cognizant Engineer per HNF-PRO-229, "Technical Procedure Requirements", as long as the changes do not impact operational facility safety function or performance, and will not compromise or influence the test data.
- 2.5.6 Acceptance Test steps detailed in individual Test Procedures in Section 5.0 are stand alone. Each test can be performed independently of other tests, unless otherwise noted or as directed by the Test Director. Individual Test Procedures may be performed out of sequence at the direction of the Test Director, if the intent of the test is not compromised. As required by subsection 2.2.4, as each step is completed, the Recorder will check off (or enter "N/A" for), or initial each Test step as required in the spaces provided on the Working Copy of this Performance Mock-Up Test Procedure. Any step that requires verification of data must also be

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recorded on the Working Copy.

2.5.7 It is the intent to perform this Performance Mock-Up Test Procedure uninterrupted from beginning to end. If testing is terminated due to time constraints at the end of an individual Test Procedure, the system will be placed in a safe configuration by the Test Director, with concurrence of the facility manager, and the terminated test configuration noted in the PMTP Performance Log. The test will restart at the next scheduled shift by establishing the noted test configuration. If testing is terminated due to a Test Exception, the equipment will be placed into a safe configuration and noted on the PMTP Performance Log. Testing cannot continue until the Test Exception is resolved. If testing may continue, the initial conditions will be established per the next individual Test Procedure. Upon resolution of the test exception, appropriate sections of the Test will be re-performed per the Test Exception Resolution Requirements.

2.5.8 Any non-conformance of the instrumentation, unexpected results or exceptions during testing shall be sequentially numbered and recorded in the PMTP Exception Log and on individual PMTP Exception Records. Thus, case-by-case resolution, recording, approval, and distribution of each exception will be achieved.

2.5.9 When an exception is identified during testing, initiate an PMTP Exception Record in the following manner (an example of a test exception would be when the system, fabricated per the design media, does not perform as expected):

- Number each exception sequentially as it occurs and record it on the PMTP Exception Log
- Enter the sequential exception number, Date, and a description of the exception on an PMTP Exception Record; identify additional detail as required
- Enter the name and/or the organization of the objecting party for each exception in the "Description of Exception" section of the PMTP Exception Record
- Enter a description of actions planned to resolve each exception on the PMTP Exception Record when such a determination is made.

2.5.10 Resolve test exceptions in the following manner:

- Record the action taken to resolve each exception in the "Resolution

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of Exception" section of the PMTP Exception Record (the action taken does not have to be the same as the recorded planned action).

- When the action taken results in an acceptable retest, initial and date the Correction Approval section of the Exception Sheet
- When the action taken does not result in an acceptable retest, provide a detailed explanation of why the retest action was not acceptable, and what additional plans are required. The explanation may include why the system should be Accepted-As-Is. The Project Engineer then signs and dates the Resolution of Exception section of the PMTP Exception Record, and obtains any other approvals required.
- Distribute requisite copies of the completed PMTP Exception Records to the client at the completion of the Performance Mock-Up Test Procedure.
- Upon completion of the Performance Mock-Up Test Procedure, obtain approval of the test performance. Each Test Execution Sheet will stand alone as approval for the system under test. The Performance Mock-Up Test Procedure will be complete when all the outstanding tests have been performed and the Performance Mock-Up Test Procedure REPORT is prepared. The test will be approved by checking the proper response, with or without exceptions, on the Test Execution Sheet under the "Approval and Acceptance of Test Results" section of the Test Execution Sheet.

NOTE - The following three sections detail the possible conditions that may exist at the completion of the Performance Mock-Up Test Procedure, and the steps necessary to complete Procedure acceptance in those conditions.

2.5.11 The completed test may be approved without test exceptions:

- Check applicable space on Test Execution Sheet to show that the Performance Mock-Up Test Procedure has been performed and no exceptions have been recorded
- Appropriate individual Test Performers will sign and date the Test Execution Sheet in the spaces provided
- Distribute requisite copies as directed by the client

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- Send the Master Copy of the completed Performance Mock-Up Test Procedure to the client.

2.5.12 The completed test may be approved with exceptions resolved:

- Check applicable space on Test Execution Sheet to show that this procedure has been performed with exceptions recorded and resolved.
- Appropriate individual Test Performers will sign and date the Test Execution Sheet in the spaces provided
- Distribute requisite copies as directed by the client
- Send the Master Copy of the completed Performance Mock-Up Test Procedure to the client.

2.5.13 The completed test may be approved with test exceptions outstanding:

- Check applicable space on Test Execution Sheet to show that this procedure has been performed with exceptions recorded, part or all of which are presently outstanding, unresolved.
- Appropriate individual Test Performers will sign and date the Test Execution Sheet in the spaces provided
- Distribute requisite copies as directed by the client
- Send the Master Copy of the completed Performance Mock-Up Test Procedure to the client.

2.5.14 Change Control

- Test procedure administrative or editorial changes required during testing may be accommodated as exceptions in the released test report, if the changes will not affect operating facility safety, function, or performance and will not compromise or influence test data. Requirement changes, changes to acceptance criteria, or changes to Danger, Caution, Special Precautions, or other safety or environmental instructions in test procedures prepared as supporting documents must be made by engineering change notice.

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3.0 PRECAUTIONS AND LIMITATIONS

3.1 PERSONNEL SAFETY

- 3.1.1 Individuals shall carry out their assigned work in a safe manner to protect themselves, others, and the equipment from undue hazards and to prevent damage to property and environment. Facility line managers shall assure the safety of all activities within their areas to prevent injury, property damage, or interruption of operation. Any hazard identified during the performance of the procedure shall be reported to the appropriate waste tank farm facility line manager. A daily pre-job safety briefing will be held with all test participants and documented in the Test Log.
- 3.1.2 Performance of test activities shall always include safety and health aspects as directed by the Test Director.
- 3.1.3 The primary safety concerns for the performance of this Performance Mock-Up Test Procedure are related to excessive force required to operate the low point drain assembly handle. Maintain proper body alignment at all times while operating valve handle.
- 3.1.4 Work shall be performed in accordance with FDNW Industrial Safety and Health Manual.

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

4.0 PREREQUISITES

4.1 SPECIAL TOOLS, EQUIPMENT, AND SUPPLIES

The following supplies shall be available at the test site:

- Electrician protective gloves
- Electrician protective eyewear (goggles or face shield)
- Long-shank lockout padlock
- Ruler, with minimum scale markings of 1/8 inch
- 120 Vac, 20 Amp, Single Pole circuit breaker
- 2 - pole, single throw switch, rated 30 Vdc @ 5 amps
- 1 - pole, single throw switch, rated 120Vac @ 15amps (4)
- 0 - 10 Volt dc adjustable voltage source

4.1.1 Voltohmmeter (VOM):

Manufacturer FLUKE Model No. 29

Serial No. METE#0840

Calibration Date 7/28/98 Expiration Date 7/28/99

4.1.2 ~~Signal Generator: 1khz Timing Module~~ Event Recorder:

Manufacturer N/A Model No. N/A

Serial No. N/A

Calibration Date N/A Expiration Date N/A

~~4.1.3 Counter: Input 10khz: 0-99999999 Millisecond Resettable~~

~~Manufacturer _____ Model No. _____~~

~~Serial No. _____~~

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

_____ Calibration Date _____ Expiration Date _____

_____ 4.1.4 Power Supply: 24v dc; Accuracy 0-0.1v

_____ Manufacturer _____ Model No. _____

_____ Serial No. _____

_____ Calibration Date _____ Expiration Date _____

_____ 4.1.5 Power Supply: 120v ac; Accuracy 0-1v

_____ Manufacturer _____ Model No. _____

_____ Serial No. _____

_____ Calibration Date _____ Expiration Date _____

_____ 4.1.6 Power Supply: 15v dc; Accuracy 0-0.1v

_____ Manufacturer _____ Model No. _____

_____ Serial No. _____

_____ Calibration Date _____ Expiration Date _____

4.2 CONDITIONS AND ACTIONS

The following conditions must be met before this Performance Mock-Up Test Procedure (PMTP) may commence:

4.2.1 **VERIFY** that a pre-job safety meeting has been held before performing this PMTP.

Kim Ewen
Test Director Signature

5/11/99
Date

4.2.2 **VERIFY** that all personnel responsible for directing and performing the PMTP have read and understand the PMTP.

Kim Ewen
Test Director Signature

5/11/99
Date

4.2.5 Test director shall **VERIFY** that a Job Safety Analysis Document has been prepared and discussed at the pre-job safety meeting.

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

Kim Ewn 5/11/99
 Test Director Signature Date

4.2.6 Test Director shall **VERIFY** that an energized Electrical Work Permit has been obtained and discussed at the pre-job safety meeting.

Kim Ewn 5/11/99
 Test Director Signature Date

~~4.2.7 Test director shall **VERIFY** that raw water only is used as the test media in performing the PMTP and discussed this at the pre-job safety meeting:~~

~~_____~~
~~_____~~
~~Test Director Signature Date~~

4.3 **VERIFY** all prerequisites in Section 4.0 are complete.

Kim Ewn 5/11/99
 Test Director Signature Date

W.P. [Signature] 5-11-99
 QC Signature Date

PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

PRELIMINARY TEST SET-UP

FIGURE 5.2.1
CONNECTION INFO ONLY

Figure 5.2.1

PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

5.0 TEST PROCEDURES

(✓)

Note: The specific scope of work covered by this performance requirement test plan involves the mock-up of a typical tank farm valve pit, valve pit leak detection relay panel and the low point drain assembly. This mock-up will be used to test the pit leak detection system and the low point drain seal assembly. The pit leak detection system model assembly shall be constructed with parts/materials as specified in drawing H-14-100983, sht. 1 and guidelines as specified in construction specification W-314-C1, Rev 0, with related Engineering Change Notices (ECN) W314-4C-026, W314-4C-041, W314-4C-052. This model pit leak detection system is to be utilized in the 241-AN- A and -B valve pit upgrade package. The low point drain assembly shall be constructed to scale with materials as specified in drawing H-14-100978, sht. 1, guidelines as specified in construction specification W-314-C1, Rev 1.0, with the following related ECN, W314-4C-037.

Wiring to the field terminal box (AN241-WT-TBX-101) will not be required for this test, however; wiring from the leak detection probe assembly to the leak detection relay panel will be required. To represent the leak detection assembly accurately, the cord sets and terminations identified in project drawings will be used.

5.1 VERIFICATION

5.1.1 **VERIFY** CIRCUIT BREAKER used in each test has a trip rating of 20 Amps.

Test Director Signature

5/11/99
Date

QC Signature

5-11-99
Date

5.2 PRELIMINARY TESTS

5.2.1 **MEASURE** the voltage on the line side of the circuit breaker (E1, Fig. 5.2.1) and verify that the voltage is between 114 and 126 volts A.C.

5.2.2 **CLOSE** breaker and **VERIFY** the load side voltage (E2, Fig. 5.2.1) is between 114 to 126 volts ac.

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5.2.3 **MEASURE** voltage on the line side of the disconnect switch (E2, Fig. 5.2.1) at the Leak Detection Relay Cabinet and **VERIFY** that the voltage is between 114 to 126 volts ac. *125.4*

5.2.4 **CLOSE** the disconnect switch (H-14-10083, Item No. 35).

5.2.5 **MEASURE** voltage at the load side of the disconnect switch (E3, Fig. 5.2.1) and **VERIFY** that the voltage is between 114 to 126 volts ac. *125.4*

Kim Evers
Test Director Signature

5/4/99
Date

W. P. Smith
QC Signature

5-11-99
Date

5.3 SETUP TESTING

Note: The following steps must be completed before testing. The MTL Trip Amplifier (H-14-100983, Item No. 22) must be set prior to testing the leak detection relay cabinet assembly. Continuity measurements across terminal points 10, 11, 12 and 13 of the voltage/trip amp relay terminal block (H-14-100983, Item No. 26) are made during this test.

5.3.1 SETTING THE MTL TRIP AMPLIFIER

Note: To set the trip point of the MTL Trip Amplifier (H-14-100983, Item No. 22), a variable 0 to 10 Vdc voltage source, continuity tester and a dc voltmeter are required.

5.3.1.1 **ENERGIZE** the leak detection relay cabinet with 120 volts ac using 20 amp CBSwitch (Fig. 5.2.1, 20 amp CBSwitch).

5.3.1.2 **APPLY** 1.5 volts dc to (H-14-100983, Item No. 22) terminals 1 and 4. This can be done by applying 1.5 volts to terminals 10 and 12 on the terminal block (H-14-100983, Item No. 26)

5.3.1.3 **VERIFY** the state of each output set of contacts (Fig. 5.3.1, R1 & R2) with the use of a continuity check. Clearly document the state of each set of contacts prior to adjusting the set point

R-1-OPEN, R-2-OPEN

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

potentiometer.

SETTING THE MTL TRIP
AMPLIFIER SET-UP

FIGURE 5.3.1

PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

- 5.3.1.4 **ADJUST** the set point potentiometer on the MTL Trip Amplifier (H-14-100983, Item No. 22) until it actuates or the output contacts change state from the state recorded above at the applied 1.5 volts dc verified by dc voltmeter (Fig. 5.3.1, DVM)
- 5.3.1.5 **VERIFY** the state of each output set of contacts with the use of a continuity check. Clearly document the state of each set of contacts prior to adjusting the set point potentiometer. **R-1 CLOSED**
R-2 CLOSED
- 5.3.1.6 **DE-ENERGIZE** the leak detection relay cabinet and **DISCONNECT** meter.
- 5.3.1.7 **VERIFY** that Section 5.3.1 is completed satisfactorily

Test Director Signature

5/11/99
Date

QC Signature

5-11-99
Date

5.4 Probe Placement PDS Requirement (3.2.1.1.3)

Requirement: Pit leak detection system shall be located a maximum of one inch above the floor in the lowest part in the pit or in a sump in the pit.

This requirement can be verified by lowering the probes down into the mock-up pit to between 0.25 and 0.50 inches and measuring the distance from the bottom of the pit floor to the bottom of the probe assembly. Refer to drawings H-14-100981, sht. 1, and H-14-100985, sht. 1 and associated ECN's for placement of the pit leak detection probes. Refer to drawing H-14-100981, sht. 1 and associated ECN's for item No.'s referenced in the following steps. Complete the following steps in order.

- 5.4.1 **LOWER** the pit leak detection probes(Item No. 2) probes through the pit leak detection access port.

- 5.4.2 **After** the probes (Item No. 2) have been lowered and the

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shielding plug (Item No. 18) is in place, **TIGHTEN** the electrode holder (Item No. 8) and stainless steel union (Item No. 10).

- 5.4.3 **ADJUST** the probes (Item No. 2) by allowing the probe wire (Item No. 4) to pass through the electrode plug cord grips (Item No. 9) in the vertical direction such that probe wiring pairs are even (without slack). TAPE probe wires above GGB.
- 5.4.4 **FEED** the probe wire (Item No. 4) through the electrode plug cord grips (Item No. 9) until the probes (Item No. 2) touch the bottom of the pit floor. **NOTE:** Do not allow slack to accumulate in the probe wire (Item No. 4) once the probes (Item No. 2) have touched the bottom of the pit floor.
- 5.4.5 **MARK** the probe wire at the top of the electrode plug cord grip with the use of masking tape or marking pen.
- 5.4.6 **PULL** the probe wire (Item No. 4) up to reflect dimensions specified in the valve pit elevation drawing per Fig. 5.4.1.
- 5.4.7 **VERIFY** the probes (item No. 2) are located within one (1) inch of the lowest part of the simulated valve pit floor.

Km. Ewan
Test Director Signature

5/11/99
Date

W. P. Smith
QC Signature

5-11-99
Date

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

BEST AVAILABLE COPY

FIGURE 5.4.1
(PDS REQUIREMENT 3.2.1.1.3 SETUP)

NOTE:

ITEM NO's REFER TO PARTS LIST ON
DRAWING H-14-100981

Figure 5.4.1

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

5.5 Response Time PDS Requirement (3.2.1.1.5)

Requirement: The required response time of the pit leak detection system shall be instantaneous. Instantaneous response time is defined as, the time allowed for the leak detection system to produce an output signal after it has detected a leak. Based on definition in PDS, this time is less than or equal to one second.

Refer to drawing H-14-100983, ~~sht. 1, rev. 0~~ and associated ECN's for item numbers in this procedure. This requirement can be satisfied by monitoring the output contacts of the ~~BAW~~ ~~intrinsically safe leak detection control~~ general purpose relay (Item No. 219) in conjunction with a double pole 2 position selector switch. (The contacts of this relay are used to activate the strobe light.) The monitor is a self-recording, time scalable, triggered event recorder. The triggering event is the closing of the double pole switch where one pole shorts the probe input terminals and the other pole starts the event recorder. The opening of the general purpose relay contacts will stop the event recorder. The interval time for this event must be 1 second or less to satisfy PDS requirement 3.2.1.1.5.

5.5.1 Refer to Fig. 5.5.1 for terminating temporary wires outside the leak detection relay cabinet for testing purposes. **VERIFY** point to point wiring from the terminal block TB-331 located inside the leak detection relay cabinet to the power sources and test switches per Fig. 5.5.1 located outside the leak detection relay cabinet. **Note:** Point to point wiring should be established before proceeding to the next step.

EXCEPTION #1

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

Figure 5.5.1

PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

5.5.2 ~~DISCONNECT~~ wire from Timer Module terminal "INH" (inhibit) and tape end of wire.

~~5.5.3 ENERGIZE~~ the 15 Vdc power supply with 120 volts ac.

~~5.5.4 ENERGIZE~~ the 24 Vdc power supply with 120 volts ac.

5.5.5 **ENERGIZE** the leak detection relay cabinet with 120 volts ac and **RESET** alarm light.

5.5.6 **SET** leak detector probes per test procedure 5.4, and **VERIFY** 24 volts dc is present between external terminal block terminals 18 and 19.

5.5.7 ~~DEPRESS~~ counter reset push-button **OPERATE** event recorder and **VERIFY** that event counter/timer reads zero.

5.5.8 **CLOSE** test switch S1, Fig. 5.5.1.

~~5.5.9 VERIFY~~ that counter indicates between 3990 and 4010 msec at 4 seconds after closing switch S1.

Note: This verifies the proper operation of the counter, timer module and 15 Vdc power supply.

~~5.5.10 OPEN~~ test switch S1, Fig. 5.5.1.

~~5.5.11 RESET~~ the local alarm/strobe warning light by depressing the hand switch (Item No. 9).

~~5.5.12 VERIFY~~ the local alarm/strobe warning light (Item No. 5) is not operating.

~~5.5.13 DE-ENERGIZE~~ the 15 Vdc power supply by opening the 120 volts ac circuit breaker.

~~5.5.14 RE-CONNECT~~ wire to Timer Module terminal "INH" (inhibit).

~~5.5.15 RE-ENERGIZE~~ the 15 Vdc power supply with 120 volts ac.

~~5.5.16 DEPRESS~~ counter reset push-button and **VERIFY** that

#1
EXCEPTION

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

counter reads zero:

5.5.17 RE-CLOSE test switch S1, Fig. 5.5.1.

5.5.18 **VERIFY** that timer indicates less than or equal to 1000 msec ± 10 msec, this is defined as equal or less than 1 second.

Note: Instantaneous response time is defined as, the time allowed for the leak detection system to produce an output signal after it has detected a leak.

5.5.19 RE-OPEN test switch S1, Fig. 5.5.1.

5.5.20 **RESET** the local alarm/strobe warning light by depressing the hand switch (Item No. 9).

5.5.21 **VERIFY** the local alarm/strobe warning light (Item No. 5) is not operating.

5.5.22 **DE-ENERGIZE** the leak detection cabinet.

5.5.23 **DE-ENERGIZE AND DISCONNECT** testing apparatus.

5.5.24 **VERIFY** that Section 5.5 is completed satisfactorily.

Test Director Signature

Date

- QC Signature

Date

5.6 Electrically Supervised Wiring PDS Requirement (3.2.1.1.6)

Requirement: The wiring between the leak detection system sensor and control panel shall be electrically supervised.

This requirement can be verified by removing the probe voltage from the probes provided by the B/W intrinsically safe control relay (Item No. 2, dwg. H-14-100983) and verify the contacts on the MTL trip amplifier (Item No. 22, dwg. H-14-100983) have changed state. Voltage can be removed from the probes by unplugging the intrinsically safe probe circuit at any plug in the probe circuit line while the leak detection relay cabinet is

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energized. (Refer to drawing H-14-100981, shts. 1 & 2, rev. 1 and associated ECN's for item numbers in this test)

- 5.6.1 **VERIFY** probe placement is complete per Section 5.4.
- 5.6.2 **ENERGIZE** the leak detection relay cabinet with 120 volts ac per Fig. 5.6.1 and **RESET** strobe warning lamp.
- 5.6.3 **REFER** to drawing H-14-100989, sht. 1, zone D-7 and associated ECN's for an example of where to unplug the probe circuit.
- 5.6.4 **UNPLUG** one of the probe circuit plugs. ✓
- 5.6.5 **VERIFY** the strobe warning light (Item No. 5) operates and stays operational. ✓
- 5.6.6 **INSERT** the plug back to it's original position. ✓
- 5.6.7 **VERIFY** the strobe warning light (Item No. 5) continue to operate. ✓
- 5.6.8 **LOCATE** and operate the "Alarm Reset" switch (Item No. 9). ✓
- 5.6.9 **VERIFY** the leak detection strobe warning light (Item No. 5) is not illuminated when the switch is operated. ✓
- 5.6.10 **DE-ENERGIZE** the leak detection cabinet. ✓
- 5.6.11 **VERIFY** that Section 5.6 is completed satisfactorily.

Km Ewn
Test Director Signature

5/11/95
Date

W. P. Shultz
QC Signature

5-11-99
Date

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

FIGURE 5.6.1
(PDS REQUIREMENT 3.2.1.1.6 SETUP)
CONNECTION INFO ONLY

Figure 5.6.1

PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

5.7 Power Loss PDS Requirement (3.2.1.2.1)

Requirement: Loss of power to the leak detection system, shall provide an output signal to the local alarm and MPS.

Refer to drawing H-14-100983, sht. 1 for item numbers in this test.

The output signal to the MPS system is generated from loss of leak detector sensing circuit voltage 120 Vac and 24 Vdc power failures. The MTL trip amplifier senses voltage generated from the B/W intrinsically safe control relay (Item No. 2). When there is a loss of power, the voltage generated by the B/W intrinsically safe control relay is no longer present for the MTL trip amplifier (Item No. 22) to sense. This causes the 24 Vdc general purpose relay (Item No. 19) to de-energize and its output contacts change state. The latch relay that operates the local alarm is energized when the general purpose relay contacts change state. A failure of the 24 Vdc power supply or the 120 Vac power source energizing the 24 Vdc power supply will also cause the 24 Vdc general purpose relay to de-energize.

The latch relay and general purpose relay are provided with an extra set of contacts. These contacts are utilized in the existing Master Pump Shutdown loop. These contacts are wired in series with other leak detection devices. The loop is interrupted when a leak or malfunction has occurred. The following test verifies that the loop described above is interrupted when a loss of power is detected.

5.7.1 **REFER** to Fig. 5.7.1 for terminating wires to the leak detection relay cabinet for testing purposes.

5.7.2 **VERIFY** point to point wiring from the terminal blocks located inside the leak detection relay cabinet to the switches S1, S2 & S3 located outside the leak detection relay cabinet. Point to point wiring should be established before proceeding to the next step. ✓

~~5.7.3 **APPLY** 24 volts dc (+) to the external terminal block at terminal 14.~~

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

FIGURE 5.7.1
(PDS REQUIREMENT 3.2.1.2.1 SETUP)
CONNECTION INFO ONLY

Figure 5.7.1

PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

~~5.7.4 APPLY 24 volts dc (-) to the external terminal block at terminal 19.~~

5.7.5 CLOSE switches S1, S2 & S3, Fig. 5.7.1.

5.7.6 ENERGIZE the leak detection relay cabinet with 120 volts ac and RESET strobe warning lamp. ✓

5.7.7 VERIFY 24 volts dc is present between external terminal block terminals 18 & 19 and 20 & 19, shown as DVM1 and DVM2 on Fig. 5.11.1. VERIFY that there is continuity between terminals 21 and 22. ✓

5.7.8 DEPRESS lamp test push button (Item #11). ✓

5.7.9 VERIFY the local alarm/strobe warning light (Item No. 5) is operational. ✓

5.7.10 OPEN switch S2, Fig. 5.7.1, and VERIFY the 24 volt dc voltage between external terminal block terminals 19 and 20, shown as DVM2, Fig. 5.11.1, is not present and the local alarm/strobe warning light (Item No. 5) is operational. This simulates a power failure to EY-331. ✓

5.7.11 PERFORM a continuity check on the external terminal block terminals 21 and 22. The continuity check should indicate the contacts on the latch relay (Item No. 15) or general purpose relay (item No. 19) are in the open position. ✓

5.7.12 RE-CLOSE switch S2, Fig. 5.7.1. ✓

5.7.13 RESET the local alarm/strobe warning light by depressing the hand switch (Item No. 9). ✓

5.7.14 VERIFY the local alarm/strobe warning light (Item No. 5) is not operating. ✓

5.7.15 OPEN switch S1; VERIFY that 24 volt dc between external terminal blocks 19 and 20, shown as DVM2 on Fig. 5.11.1, is present; and repeat steps 5.7.11 through 5.7.14 except RE-CLOSE switch S1 in step 5.7.12. This simulates a power failure to LDK-331. ✓

5-11-99
(TYPED)
NOT
RTC 5/13/99
21-22 ✓
C ✓
K ✓

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

5.7.16 OPEN switch S3; **VERIFY** that 24 volt dc between external terminal blocks 19 and 20, shown as DVM2 on Fig. 5.11.1, is present; and repeat steps 5.7.11 through 5.7.12 except **RE-CLOSE** switch S3 in step 5.7.12. This simulates a power failure to 24 Vdc power supply PS-331.

VP
5-11-99
(TYPED)

RTC
5/13/99

21-22 OPEN
23.95VDC

5.7.17 OPEN 20 amp circuit breaker to remove power. ✓

5.7.18 DISCONNECT test wiring and RE-CONNECT permanent wiring.

5.7.19 VERIFY that Section 5.7 is completed satisfactorily.

Kim E. ...

Test Director Signature Date

5/14/99

W. A. ...

QC Signature

5-11-99
Date

5.8 Failsafe PDS Requirement (3.2.1.2.2)

Requirement: A detected failure in the leak detection system shall provide an output signal to the local alarm and MPS system.

The leak detection system is designed to initiate the local alarm and master pump shutdown given the following failures. The first failure is the BWV intrinsically safe leak detection relay (Item No. 2) failure. Upon failure of the leak detection relay, the probe voltage will no longer be present and the shutdown signal will be generated from the trip amplifier (Item No. 22) as verified by section 5.7. The second failure is the probe wire and wire connectors failing. Upon failure of any leak detection probe wire or connector, the local alarm and the master pump shutdown is activated. In addition to these failures, the local warning light (Item No. 5) and the master pump shutdown system will also activate upon failure of the trip amplifier (Item No. 22) and the failsafe relay (Item No. 19).

Performance for this requirement has been demonstrated in sections 5.6 and 5.7 of this Performance Mock-Up Test Procedure. Refer to these sections to identify the test procedures.

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

Test Director Signature

5/1/99

Date

QC Signature

5-11-99

Date

5.9 Operational Test PDS Requirement (3.2.1.2.3 and 3.2.1.3.2)

Requirement (3.2.1.2.3): The leak detection system shall perform an operational test of itself when commanded by the MPS system. The test shall cover alarms, circuitry, and sensors of the leak detection system.

Refer to drawing H-14-100983, sht. 1, for item numbers in this test.

The leak detection relay cabinet was designed with two intrinsically safe relays used for testing (Item No. 13). The selector switch (Item No. 6) is used for two operations. The first operation is for testing the leak detection relay by simulating a leak in the pit with the addition of a 8.2 kohm resistor between the probes from the leak detection relay cabinet. The second test is to interrupt (open) the leak detection sensing circuit at the leak detection relay cabinet and verify the leak detection failsafe circuit is operational.

By rotating the selector switch to the "fail relay test" position, the leak detection relay will activate sending a signal to the local warning light and to the PLC as a leak detected.

By rotating the selector switch to the "Probe Test" position, the trip amplifier will monitor a loss of voltage and activate the local warning light and the PLC as a trouble alarm.

Each function mentioned above activates a latch relay and transformer which supplies power to the local warning light. This latch relay can be reset from the leak detection relay cabinet or from the PLC. If the leak or trouble is still present, the warning light will continue to operate until recovery or maintenance has occurred.

This test can be verified by externally applying 24 volts dc to the test relays and the reset coil of the latch relay and then observe

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

the operation of the strobe warning light .

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

FIGURE 5.9.1
(PDS REQUIREMENT 3.2.1.2.3 & 3.2.1.3.2 SETUP)
CONNECTION INFO ONLY

Figure 5.9.1

PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

- 5.9.1 **SETUP** test per Fig. 5.9.1. **VERIFY** test setup wiring. **ENERGIZE** the leak detection relay cabinet with 120 volts ac utilizing 20 amp CBSwitch and **RESET** local alarm/strobe light. ✓
- 5.9.2 **LOCATE** and identify the selector switch "Probe Test-Operate-Fail Test" (Item No. 6).
- 5.9.3 **ROTATE** the selector switch to the "Probe Test" position then release, allowing spring return to the "Operate" position. ✓
- 5.9.4 **VERIFY** that the strobe warning light (Item No. 5) operates and continues to operate. ✓
- 5.9.5 **APPLY** 24 volts dc (+) momentarily (**CLOSE S1**, then **RE-OPEN S1**) to the external terminal block at terminal 15 by closing switch S1, Fig. 5.9.1. ✓
- 5.9.6 **VERIFY** the leak detection strobe warning light (Item No. 5) is not illuminated when 24 volts dc is momentarily applied to terminal block terminal 15. ✓
- 5.9.7 **APPLY** 24 volts dc (+) momentarily (**CLOSE S2**, then **RE-OPEN S2**) to the external terminal block at terminal 16 to energize the leak detection test relay by closing switch S2. ✓
- 5.9.8 **VERIFY** the local alarm/strobe warning light (Item No. 5) is operational. ✓
- 5.9.9 **RESET** the local alarm/strobe warning light by depressing/turning the hand switch (Item No. 9). ✓
- 5.9.10 **VERIFY** the local alarm/strobe warning light (Item No. 5) is not operating. ✓
- 5.9.11 **APPLY** 24 volts dc (+) momentarily (**CLOSE S3**, then **RE-OPEN S3**) to the external terminal block at terminal 17 to energize the interrupt sensing circuit test relay by closing switch S3, Fig. 5.9.1. ✓

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

- 5.9.12 **VERIFY** the local alarm/strobe warning light (Item No. 5) is operational. ✓
- 5.9.13 **RESET** the local alarm/strobe warning light by depressing the hand switch (Item No. 9). ✓
- 5.9.14 **VERIFY** the local alarm/strobe warning light (Item No. 5) is not operating. ✓
- 5.9.15 **DE-ENERGIZE** the leak detection relay cabinet and disconnect test wiring. ✓
- 5.9.16 **VERIFY** that Section 5.9 is completed satisfactorily.

Kim Ewer
Test Director Signature

5/11/99
Date

W. H. Cantrell
QC Signature

5-11-99
Date

5.10 Removable Probes PDS Requirement (3.2.2.2)

Requirement: The portion of the pit leak detection system within the pit shall be replaceable without removing the pit cover block.

This requirement can be satisfied by installing and removing the probes from on top of the mock-up pit. Reference drawing H-14-100981, sht. 1&2 for item numbers.

- 5.10.1 **VERIFY** probe placement is complete per Section 5.4.
- 5.10.2 **REMOVE** the probes by disconnecting the union (item 10), removing the shielding plug and carefully withdrawing the leak detector probes. (Note: Ensure that lower half of union does not move when loosening.)
- 5.10.3 **RE-INSTALL** the probes by repeating Steps 5.4.1 through 5.4.7.
- 5.10.4 **VERIFY** Section 5.10 is completed satisfactorily.

Kim Ewer

5/11/99

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

Test Director Signature

Date

3-11-99

QC Signature

Date

5.11 Leak Detection PDS Requirement (3.2.1.1.1, 3.2.1.1.2, 3.2.1.3.3 and 3.2.4.4)

Requirement: (3.2.1.1.1) The pit leak detection system shall detect the presence of a leak within twenty-four hours. (See definition of leak).

Requirement: (3.2.1.1.2) The pit leak detection shall monitor for liquids during a waste transfer and shall provide a signal when a leak is detected.

Requirement: (3.2.1.3.3) The local alarm shall operate as follows:

- Immediately upon detecting a leak or malfunction, the local alarm shall flash and produce an audible alarm.
- After the local alarm is acknowledged by an operator located at either the MPS System HMI or the local alarm cabinet, the local alarm shall remain flashing until recovery occurs.
- After the alarm is acknowledged at the MPS System HMI, the audible signal shall be silenced.
- When recovery occurs (the leak or malfunction has been corrected) and after the local alarm is acknowledged, the local alarm shall cease illuminating.

Requirement: (3.2.4.4) The pit leak detection system probe assembly that is located within the pits shall be testable in place with the addition of water into the pit.

Definition of Leak: (5.1.4) Leaks from waste transfer systems at the Hanford Site are established for each specific project. Each project demonstrates to the Washington Department of Ecology that the proposed system meets state regulations. The leak for the proposed system is established in this process. The leak defined for the pit leak detection system has been established at 10 gallons in a 24 hour period.

Requirement 3.2.4.4 can be satisfied by adding saltwater for a period of 24 hours or less through a hole in the simulated cover block until the local warning light is actuated. Note that 1.9

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

teaspoons of salt added to each gallon of water produces a solution conductivity equal to that of the tank waste in tank AN101. It is recommended that 1 nominal teaspoon of salt per gallon be used for to simulate a flushing solution. Additionally, this procedure can be used to simulate a waste leak and thus satisfy requirements 3.2.1.1.1 and 3.2.1.1.2.

By removing the top cover in the electrode holder and loosening the Hubble cord grips, the probe wire is capable of being extracted, refer to section 4.11. This extraction raises the level of one electrode. Raising the pit floor drain assembly will allow the saltwater to drain. By doing this, the probes are no longer shorted by the presence of salt water. Once the probes has been lifted and secured are out of the salt water, pressing turning the local reset button switch will cause the alarm to clear. The alarm sequence is thereby demonstrated and thus satisfying requirement 3.2.1.3.3. (Note that audible alarm test is not part of this procedure).

- 5.11.1 REFER to Fig. 5.11.1 for setting up the leak detection equipment for testing purposes except omit DVM1 and DVM2.
- 5.11.2 ENERGIZE the leak detection relay cabinet with 120 volts a via 20 amp GBSwitch and DS-331 as shown on Figure 5.11.1 and RESET local alarm/strobe light.
- 5.11.3 SEAL low point floor drain assembly FD-1.
- 5.11.4 REPEAT test procedure 5.4, if necessary, to obtain the following probe placement.
- 5.11.5 VERIFY that leak detector probes are located 0.5 ± 0.10 between 0.25 and 0.50 inches above the lowest point in the Pit floor.
- 5.11.6 ADD 1 gallon of shop water to a bucket. ADD 1 nominal teaspoon of salt to each bucket of shop water. ADD saltwater to Pit at a rate of approximately 1 gal every 5 minutes up to a total of 10 gal.
2:45 pm 5-11-99 VP
I, I, I, I, I, I, I, I, I, I
I, I, I, I
2:45 pm 5-11-99 VP
 Date/Time Water Add Commenced
 (Add ballast to mock-up pit to get an alarm if

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

necessary.)

- 5.11.7 VERIFY that the local alarm/strobe warning light (Item No. 5) operates within 24 hours or less.

5-11-99 3:10 AM VP
Date/Time of Alarm

- 5.11.8 VERIFY the drain seals adequately by performing the following:

- 5.11.8.1 Wait 24 hours after the alarm activated. ✓

8:50 AM 5-13-99

- 5.11.8.2 Check that the alarm cannot be reset by ✓
pushing turning the reset button switch.

- 5.11.9 RETRACT floor drain assembly to drain the pit.

- 5.11.10 VERIFY the strobe warning light (Item No. 5) continues to operate.

- 5.11.11 OPERATE the "Alarm Reset" switch (Item No. 9).

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Figure 5.11.1

PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

- 5.11.11 **VERIFY** the leak detection strobe warning light (Item No. 5) is not illuminated when the "Reset" switch is operated. ✓
- 5.11.12 **VERIFY** pit has completely drained. ✓
- 5.11.13 **DE-ENERGIZE** the leak detection relay cabinet ✓
- 5.11.14 **RINSE** leak detection probes and mock-up pit with salt free water thoroughly such that saltwater is removed from the probes and pit.
- 5.11.15 **VERIFY** that Section 5.11 is completed satisfactorily.

Richard D. Canatt 5-13-99
 Test Director Signature Date

W. J. [Signature] 5-13-99
 QC Signature Date

5.12 EM Interference PDS Requirement (3.3.2.1)

Requirement: Hand held radio and cell phone wattage shall not interfere with leak detection components at a distance of one meter.

This requirement can easily be determined by operating a hand held radio and cellular phone within one meter of all leak detection relay components.

- 5.12.1 **OBTAIN** a hand held radio and cell phone with fully charged batteries.
- 5.12.2 **ENERGIZE** the leak detection relay cabinet with 120 volts ac.
- 5.12.3 **OPERATE** a hand held radio and cellular phone within one meter of all leak detection relay components.
- 5.12.4 **VERIFY** false signals are not induced as a result of this step.
- 5.12.5 **DE-ENERGIZE** the leak detection relay cabinet.

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

5.12.6 **VERIFY** that Section 5.12 is completed satisfactorily.

Test Director Signature

5/11/99
Date

QC Signature

5/11/99
Date

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PMTP EXCEPTION RECORD

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PMTP STEP NUMBER: SECTION 5.5	PMTP EXCEPTION LOG#: ①
DESCRIPTION OF EXCEPTION: REQUIREMENT 3.2.1.1.5 STATES	
THAT PIT LEAK DETECTION RESPONSE SHALL BE	
INSTANTANEOUS AND FURTHER DEFINED TO BE ≤ 1 SEC.	
DATE OF EXCEPTION: 5/11/99	
RESOLUTION OF EXCEPTION: ACCEPT-AS-IS.	
THE PDS SHOULD BE MODIFIED TO DELETE THE	
"DEMO" REQUIREMENT AND ENGINEERING	
ANALYSIS PERFORMED TO SHOW THAT PDS	
REQUIREMENT IS READILY SATISFIED.	
(ECN# W-314-4C-103)	DATE OF RESOLUTION: 05-19-99
TEST DIRECTOR SIGNATURE: <i>Km Ewer</i>	DATE: 5/11/99
PROJECT ENGINEER SIGNATURE: <i>W. J. ...</i>	DATE: 5/11/99
QUALITY ASSURANCE SIGNATURE: <i>[Signature]</i>	DATE: 5-17-99

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