STA# 4

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Project W-314/TWRS		D. E. Bowers		N/A	
8. Originator Remarks:				9. Equip./Component No.:	
This EDT releases for construction the approved Leak Detector Mock-up Test Procedure for the 241-AN Tank Farm Upgrade Package, part of Project W-314. This modification (procedure) will not change collective dose since it has no impact on radiological sources, contamination control, or shielding. <i>DES 4-5-99</i>				N/A	
11. Receiver Remarks:				10. System/Bldg./Facility:	
11A. Design Baseline Document? ☐ Yes ☒ No USA is not required. This procedure is not performed within a TWRS facility. It is not a proposed activity that makes a physical change to any TWRS physical system, structure, or component described in the authorization basis, reportable occurrence or PIAB. Therefore it is outside the requirements of HNF-EP-0842, IX, 5.4, Rev 10; unreviewed Safety Questions. <i>DES 4-7-99</i>				N/A	
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1	TWR-4064		0	Project W-314 Performance Mock-Up Test Procedure	ESQ 2
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(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN
2	1	Design Authority D E Bowers	<i>DEB</i>	4-7-99	13
2	1	Design Agent P J Bedell	<i>PJB</i>	4-12-99	63-12
2	1	Major Eng. J L Gilbert	<i>JLG</i>	4-25-99	63-25
2	1	Major Mgr. H M Chafin	<i>HMC</i>	4-25-99	63-25
2	1	QA O M Jalla	<i>OMJ</i>	4-18-99	63-25
2	1	Safety T A Dillhoff	<i>TAD</i>	4-12-99	63-25
18. R. T. Carratt Signature of EDT Originator Date: 4/1/99					
19. J. L. Gilbert Authorized Representative for Receiving Organization Date: 4/2/99					
20. Design Authority/Cognizant Manager Date:					
21. DOE APPROVAL (if required) Ctrl No. _____ ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments					

Project W-314 Performance Mock-Up Test Procedure

Richard T. Carratt

Fluor Daniel Northwest, Richland, WA 99352

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Abstract: 241-AN-A & AN-B Valve Pit Leak Detection and Low Point Drain Assembly Performance Mock-Up Test Procedure.

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Approved for Public Release

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 3/24/99
Richard T. Carratt, Lead Engineer, FDNW Date

Concurrence: Phil J. Bedell 3/24/99
Phil J. Bedell, Design Agent, FDNW Date

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Tim W. Bohan, Operations, LMHC Date

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PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

TEST EXECUTION SHEET

DATE:	DOCUMENT NUMBER: TWR-4064	
DOCUMENT TITLE: 241-AN-A VALVE PIT TRANSFER VALVES		
TEST PERSONNEL (PRINT NAMES)		
TEST DIRECTOR:	FDNW PROJECT ENGINEER:	
QC:	RECORDER:	
ELECTRICIAN:		
TEST EXECUTION		
TEST DIRECTOR SIGNATURE/DATE:	FDNW PROJECT ENGINEER SIGNATURE/DATE:	
QC SIGNATURE/DATE:	RECORDER SIGNATURE/DATE:	
ELECTRICIAN SIGNATURE/DATE:		
APPROVAL AND ACCEPTANCE OF TEST RESULTS		
WITHOUT EXCEPTION WITH EXCEPTIONS RESOLVED WITH EXCEPTIONS REMAINING		
____ (✓) ____ (✓) ____ (✓)		
TEST DIRECTOR SIGNATURE/DATE:	NHC PROJECT MANAGER SIGNATURE/DATE:	
FDNW PROJECT MANAGER SIGNATURE/DATE:	QUALITY ASSURANCE SIGNATURE/DATE:	
ACCEPTANCE INSPECTOR SIGNATURE/DATE:	COGNIZANT ENGINEER SIGNATURE/DATE:	
OPERATIONS SIGNATURE/DATE:		

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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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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- 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
	Test Director		
	Recorder		
	Witness		
	Witness		
	Witness		
	FDNW Project Engineer		
	Construction Representative		
	FDNW Quality Control		
	FDNW Quality Engineering		
	Cognizant Engineer		
	Operations		

PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

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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- 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.

PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

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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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 30 Vdc @ 5 amps (3)

4.1.1 Volttohmer (VOM):

Manufacturer _____ Model No. _____

Serial No. _____

Calibration Date _____ Expiration Date _____

4.1.2 Signal Generator: 1khz Timing Module

Manufacturer _____ Model No. _____

Serial No. _____

Calibration Date _____ Expiration Date _____

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

Manufacturer _____ Model No. _____

Serial No. _____

Calibration Date _____ Expiration Date _____

PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

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.

Test Director Signature _____ Date

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

Test Director Signature _____ Date

PROJECT W-314 PERFORMANCE MOCK-UP TEST PROCEDURE

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

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.

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.

Test Director Signature _____ Date

QC Signature _____ Date

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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 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 _____ Date

QC Signature _____ 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.

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Figure 5.2.1

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

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.

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.

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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 CB (Fig. 5.2.1, 20 amp CB).

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)

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- 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 potentiometer.
- 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.
- 5.3.1.6 **DE-ENERGIZE** the leak detection relay cabinet.
- 5.3.1.7 **VERIFY** that Section 5.3.1 is completed satisfactorily

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5.4 Probe Placement PDS Requirement (3.2.1.1.3)

Requirement: Pit leak detection system shall be located 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 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.

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

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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 B/W intrinsically safe leak detection control relay (Item No. 2). The contacts of this relay are used to activate the strobe light.

- 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.

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- 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.
- 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 and **VERIFY** that counter 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 counter reads zero.

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- 5.5.17 **RE-CLOSE** test switch S1, Fig. 5.5.1.
- 5.5.18 **VERIFY** that timer indicates less than 1000 msec $\pm$ 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.

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

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- 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.
- 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.

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FIGURE 5.6.1
(PDS REQUIREMENT 3.2.1.1.6 SETUP)

Figure 5.6.1

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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.

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FIGURE 5.7.1
(PDS REQUIREMENT 3.2.1.2.1 SETUP)

Figure 5.7.1

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- 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.
- 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.
- 5.7.7 **VERIFY** 24 volts dc is present between external terminal block terminals 18 & 19 and 20 & 19. **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) 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.

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5) is not operating.

5.7.15 **OPEN** switch S1 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.

5.7.16 **OPEN** switch S3 and repeat steps 5.7.11 through 5.7.14 except **RE-CLOSE** switch S3 in step 5.7.12. This simulates a power failure to 24 Vdc power supply PS-331.

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.

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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 BW 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

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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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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

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occurred.

This test can be verified by externally applying 24 volts dc to the test relays and the reset relay.

SETUP test per Fig. 5.9.1.

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FIGURE 5.9.1
(PDS REQUIREMENT 3.2.1.2.3 & 3.2.1.3.2 SETUP)

Figure 5.9.1

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- 5.9.1 **ENERGIZE** the leak detection relay cabinet with 120 volts ac utilizing 20 amp CB.
- 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 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 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 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 to the external terminal block at terminal 17 to energize the interrupt sensing circuit test relay by closing switch S3, Fig. 5.9.1.
- 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).

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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.

5.9.16 **VERIFY** that Section 5.9 is completed satisfactorily.

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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.

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.

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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

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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 water for a period of 24 hours or less through a hole in the simulated cover block until the local warning light is actuated. Additionally, this procedure can be used to simulate a 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 wire is capable of being extracted, refer to section 4.11. This extraction raises the level of one electrode. By doing this, the probes are no longer shorted by the presence of water. Once the probe has been lifted and secured out of the water, pressing the local reset button will cause the alarm to clear. The alarm sequence is thereby demonstrated. (Note that audible alarm test is not part of this procedure).

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- 5.11.1 REFER to Fig. 5.11.1 for setting up the leak detection equipment for testing purposes.
- 5.11.2 **ENERGIZE** the leak detection relay cabinet with 120 volts a via 20 amp CB and DS-331 as shown on Figure 5.11.1.
- 5.11.3 **SEAL** low point floor drain assembly FD-1.
- 5.11.4 **REPEAT** test procedure 5.4 to obtain the following probe placement.
- 5.11.5 **VERIFY** that leak detector probes are located 0.5 ± 0.10 inches above the lowest point in the Pit.
- 5.11.6 **ADD** water to Pit at a rate of approximately 1 gal every 5 minutes up to a total of 10 gal.
- Date/Time Water Add Commenced
- 5.11.7 **VERIFY** that the local alarm/strobe warning light (Item No. 5) operates within 24 hours or less.
- 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.
- 5.11.8.2 Check that the alarm cannot be reset by pushing the reset button.
- 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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- 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 **VERIFY** that Section 5.11 is completed satisfactorily.

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

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PMTP PERFORMANCE LOG

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PMTP EXCEPTION LOG

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PMTP EXCEPTION RECORD

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PMTP STEP NUMBER:	PMTP EXCEPTION LOG#:
DESCRIPTION OF EXCEPTION:	
DATE OF EXCEPTION:	
RESOLUTION OF EXCEPTION:	
DATE OF RESOLUTION:	
TEST DIRECTOR SIGNATURE:	DATE:
PROJECT ENGINEER SIGNATURE:	DATE:
QUALITY ASSURANCE SIGNATURE:	DATE:

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D. L. McGrew	R3-25	x			
J. W. Middleton	B4-68	x			
J. E. Navarro	A2-22	x			
B. L. Syverson	G3-12	x			
M. W. Tiffany	R1-49	x			
D. W. VanDyke	R2-82	x			
T. L. Warnick	G3-12	x			
Project Files Library	R3-25	G3-12	x		
Construction Document Control		S2-53	x		
LHFC Project Files		R1-29	x		