



Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

September 30, 2010

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Watts Bar Nuclear Plant, Unit 2
NRC Docket No. 50-391

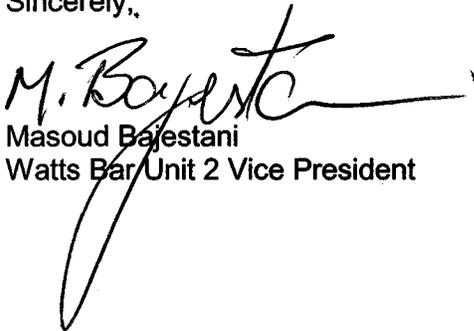
Subject: Watts Bar Nuclear Plant (WBN) Unit 2 – Submittal of Pre-op Test Instruction

The following approved WBN Unit 2 Pre-op Test Instruction (PTI) is enclosed:

PTI NUMBER	Rev.	TITLE
2-PTI-081-01	0	Primary Makeup Water System

If you have any questions, please contact Pete Olson at (423) 365-3294.

Sincerely,



Masoud Bajestani
Watts Bar Unit 2 Vice President

U.S. Nuclear Regulatory Commission
Page 2
September 30, 2010

cc (Enclosure):

U. S. Nuclear Regulatory Commission
Region II
Marquis One Tower
245 Peachtree Center Ave., NE Suite 1200
Atlanta, Georgia 30303-1257

NRC Resident Inspector Unit 2
Watts Bar Nuclear Plant
1260 Nuclear Plant Road
Spring City, Tennessee 37381

WATTS BAR NUCLEAR PLANT
UNIT 2 STARTUP

TITLE: Primary Makeup Water System

Instruction No: 2-PTI-081-01

Revision No: 0000

PREPARED BY: Ross Horvat Ross Horvat DATE 9-24-2010

PRINT NAME/ SIGNATURE

REVIEWED BY: Chris Boudreau Chris Boudreau DATE 9-27-2010

PRINT NAME/ SIGNATURE

INSTRUCTION APPROVAL

JTG MEETING NO: 2-10-009

JTG CHAIRMAN: [Signature] DATE 9/27/10

APPROVED BY: [Signature] DATE 9/27/10

PREOPERATIONAL STARTUP MANAGER

TEST RESULTS APPROVAL

JTG MEETING NO: _____

JTG CHAIRMAN: _____ DATE _____

APPROVED BY: _____ DATE _____

PREOPERATIONAL STARTUP MANAGER

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Revision Log

Revision or Change Number	Effective Date	Affected Page Numbers	Description of Revision/Change
0000	<i>9/27/10</i>	ALL	Initial issue. Created from microfilm copy of Unit 1 PTI-081-01, Rev 2 and CN-1 thru CN-5 and updated to Word 2007.

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1.0 INTRODUCTION

1.1 Test Objectives

- A. The Primary Makeup Pumps meets or exceeds the design hydraulic performance characteristics.
- B. Primary Makeup Water can be supplied to all required locations for Unit 2.
- C. Valve controls and interlocks function properly in response to normal input signals.

1.2 Scope

- A. Verify the hydraulic performance of the Primary Makeup Pumps meets or exceeds the performance characteristics.
- B. Verify Primary Makeup Water is supplied to all required locations in Unit 2.
- C. Verify control and interlocks function properly in response to normal input signals.

2.0 REFERENCES

2.1 Performance References

- A. SMP-9.0, Conduct of Test
- B. SMP-15.0, Status and Control of Isolation Devices
- C. 0-SOI-81.01, Primary Makeup Water system.
- D. N3C-945, Procedure for Evaluation and Qualification of Piping System Vibrations.

2.2 Developmental References

- A. Final Safety Analysis Report
 - 1. FSAR - Amendment 99
 - a. FSAR Table 6.2.4-1, sheet 26 "Containment Penetrations and Barriers"

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2.2 Developmental References (continued)

b. FSAR Table 14.2-1, Sheet 6, "Primary Makeup Water system Test Summary"

2. System Description

a. WBN2-81-4001, Rev 1, System Descriptions for Primary Makeup Water system.

b. N3-81-4001, Rev 11, Primary Makeup Water system.

B. Drawings

1. Flow Diagrams

a. 2-47W819-1, Rev 2, Flow Diagram, Primary Water

DRA 53036-304, Rev 0

DRA 53354-2, Rev 0

DRA 53354-3, Rev 0

DRA 52490-2, Rev 1

DRA 52490-6, Rev 0

DRA 53421-4, Rev 0

DRA 54782-20, Rev 0

b. 2-47W809-1, Rev 2, Flow Diagram, Chemical and Volume Control System

c. 2-47W809-2, Rev 2, Flow Diagram, Chemical and Volume Control System (Boron Recovery)

d. 1-47W809-3, Rev 23, Flow diagram, Chemical and Volume Control System (Boron Recovery)

e. 1-47W809-4, Rev 12, Flow diagram, Chemical and Volume Control System (Boron Recovery)

f. 2-47W809-5, Rev 0, Flow diagram, Chemical and Volume Control System (Boron Recovery)

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2.2 Developmental References (continued)

- g. 2-47W830-1, Rev 1, Mechanical Flow Diagram Waste Disposal System
 - h. 1-47W830-3, Rev 21, Mechanical Flow Diagram Waste Disposal System
 - i. 2-47W830-4, Rev 1, Mechanical Flow Diagram Waste Disposal System
 - j. 2-47W855-1, Rev 0, Mechanical Flow Diagram, Fuel Pool Cooling and Cleaning System
 - k. 2-47W856-1, Rev 1, Flow Diagram Demineralized Water and Cask Decon System
 - l. 2-47W848-5, Rev 1, Mechanical Flow Diagram Control Air
 - m. 2-47W848-9, Rev 1, Mechanical Flow Diagram Control Air
 - n. 2-47W625-7, Rev 1, Radiation Sampling System Aux and Reactor Building.
2. Electrical
- a. 2-45W600-81, Rev 0, (CC) Wiring Diagrams Primary Makeup Water System Schematic Diagrams
 - b. 2-47B601-55-3, Rev 0, (CC), Electrical Instrument Tabulation
DRA 52453-6, Rev 0
 - c. 45B640-11, Rev 0, (AD), Contact Development of Control and Instrument Switches
 - d. 2-45B640-28, Rev 0, (CC), Contact Development of Control and Instrument Switches
DRA 52361-26, Rev 0.
 - e. 2-45B640-154, Rev 1, (CC), Contact Development of Control and Instrument Switches
DRA 52362-38, Rev 0.
 - f. 45W703-7, Rev 19, (AD), Wiring Diagrams, 125V Vital Battery Board III Panel 3 Connection Diagram, Sheet 7

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2.2 Developmental References (continued)

- g. 45W703-8, Rev 20, (AD), Wiring Diagrams, 125V Vital Battery Board IV Panel 4 Connection Diagram, Sheet 8
- h. 45N703-3, Rev 22, (AD), Wiring Diagrams, 125V Vital Battery Board III Panel 3 Single Line, Sheet 3
- i. 45N703-4, Rev 18, (AD), Wiring Diagrams, 125V Vital Battery Board IV Panel 4 Single Line, Sheet 4
- j. 2-45W756-9, Rev 0, Wiring Diagram, 480V Control and Auxiliary Vent Board 2A1-B Single Line, Sheet 10
- k. 2-45W756-10, Rev 0, Wiring Diagram, 480V Control and Auxiliary Vent Board 2B1-B Single Line, Sheet 10
- l. 2-45W756-2, Rev 0, Wiring Diagram, 480V Control and Auxiliary Vent Board 2A1-A Single Line, Sheet 2
- m. 2-45W756-6, Rev 0, Wiring Diagram, 480V Control and Auxiliary Vent Board 2B1-B Single Line, Sheet 6
- n. 2-45W760-81-1, Rev 0, Wiring Diagram Primary Makeup Water System Schematic Diagrams

DRA 53290-44, Rev 0

DRA 53290-59 , Rev 0
- o. 45W2638-1, Rev 8, (AD), Wiring Diagram Aux Control Board - Panel 2-L-11A Connection Diagram Sheet 1
- p. DRA 54870-149, Rev 0
- q. 45N2638-3, Rev 4, (AD), Wiring Diagram Aux Control Board - Panel 2-L-11A Connection Diagram Sheet 3
- r. 45N2644-4, Rev 6, (AD), Wiring Diagram Unit Control Board - Panel 2-M-5 Connection Diagram Sheet 4
- s. 45N2644-6, Rev 9, (AD), Wiring Diagram Unit Control Board - Panel 2-M-5 Connection Diagram Sheet 6
- t. 45N2676-4, Rev 16, (AD), Wiring Diagrams, Solid State Protection System Train A Connection Diagram sheet 4

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2.2 Developmental References (continued)

- u. 2-45B655-6F, Rev 0, Main Control Room Annunciator Inputs Window Box XA-55-6F
- v. 2-45B655-5B, Rev 0, Main Control Room Annunciator Inputs Window Box XA-55-5B
DRA 52378-225, Rev 0
- w. 2-45B655-E5B, Rev 0, Annunciator Window Box XA-55-5B Engraving
DRA 52378-236, Rev 0
- x. 2-45B655-E6F, Rev 0, Annunciator Window Box XA-55-6F Engraving
- y. 7246D11-18, Rev 4, Solid State Protection System Interconnection Diagram

3. Mechanical

None

4. Logic/Control

- a. 2-47W610-81-1, Rev 1, Electrical Control Diagram Primary Makeup Water System
- b. DRA 53036-258, Rev 0
- c. DRA 53354-10, Rev 0
- d. DRA 53649-57, Rev 0

5. Vendor Manuals

None

C. Documents

- 1. SSD-1-LPL-81-1, Primary Water Storage Tank Level Loop, Rev 8
To be verified against SSD-2-LPL-81-1, Primary Water Storage Tank Level Loop [Later] in Appendix A.
- 2. SSD-1-PI-81-2, Primary Water Pump A Suction Pressure, Rev 3

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2.2 Developmental References (continued)

- To be verified against SSD-2-PI-81-2, Primary Water Pump A Suction Pressure [Later] in Appendix A.
3. SSD-1-PI-81-4, Primary Water Pump A Outlet Pressure, Rev 3
To be verified against SSD-2-PI-81-4, Primary Water Pump A Outlet Pressure [Later] in Appendix A.
 4. SSD-1-PI-81-6, Primary Water Pump B Suction Pressure, Rev 3
To be verified against SSD-2-PI-81-6, Primary Water Pump B Suction Pressure [Later] in Appendix A.
 5. SSD-1-PI-81-8, Primary Water Pump B Outlet Pressure, Rev 2
To be verified against SSD-2-PI-81-8, Primary Water Pump B Outlet Pressure [Later] in Appendix A.
 6. 2-TSD-81, Primary Makeup Water System, Rev 0

3.0 PRECAUTIONS AND LIMITATIONS

- A. Standard precautions shall be followed for working around energized electrical equipment in accordance with TVA Safety Procedure 1021.
- B. Steps may be repeated if all components cannot be tested in a step. However, if the test has been exited, prerequisite steps must be re-verified and a Chronological Test Log (CTL) entry made.
- C. Component tags and labels may differ slightly (abbreviations, punctuation, letter case, etc.) from the description given in this test. If this situation occurs, it shall not be considered a test deficiency or procedure deviation. It shall be documented in the CTL and reconciled by way of a plant labeling request or drawing discrepancy as appropriate.
- D. All wires removed/lifted from a terminal shall be identified and taped or covered with an insulator to prevent personnel or equipment hazard and possible spurious initiations. The wires should be grouped together and labeled with the work implementing document number that required them to be lifted if left unattended.
- E. All open problems (including non Tech Spec testing acceptance criteria) are to be tracked by a corrective action document and entered on the appropriate system punchlist.

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3.0 PRECAUTIONS AND LIMITATIONS (continued)

- F. Problems identified during the test shall be annotated on the CTL including a description of the problem, the procedure step when/where the problem was identified, corrective action steps taken to resolve the problem, and the number of the corrective action document, if one was required.
- G. Observe all Radiation Protection (RP) requirements when working in or near contaminated areas.
- H. Ensure no adverse impact to the operation of Unit 1 structures, systems or components.
- I. Test Director shall coordinate with Unit 1 Operations when manipulating equipment controlled by Unit 1
- J. Section 6.4 will require disabling the Unit 1 Primary water system. Ensure permission from Unit 1 operations is obtained prior to beginning this section of testing.
- K. The Primary Water Storage Tank (PWST) level should remain above the Low Level Alarm when any Primary Makeup water Pump is running.
- L. When adding makeup to the PWST, ensure level is less than high level alarm.
- M. Cycling the Primary Makeup Water Pumps should be limited to two cold starts or one hot start per hour.
- N. Local timing begins with the initiating signal and is concluded with the completion of valve stem movement. Remote timing begins with the initiating signal and is concluded with the position indication lights status change. Stroke time acceptance criteria will be based on the movement to the safety function final position of the valve.
- O. Any SOIs utilized for system alignment will be recorded in the Chronological Test Log.
- P. Ensure inaccuracy in measuring instrumentation loop is considered in determining acceptance criteria.
- Q. During the performance of this procedure visual observation of piping and components is required. This includes steady state and transient operations with visual confirmation that vibration is not excessive.
- R. If the vibration is determined to be excessive the Test Engineer shall initiate a Test Deficiency Notice (TDN). Submit the findings to Predictive Maintenance.

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4.0 PREREQUISITE ACTIONS

NOTE

Preliminary action steps may be performed in any order with Test Directors approval.

4.1 Preliminary Actions

- [1] **VERIFY** the test/performance copy of this Preoperational Test Instruction (PTI) is the current revision and as needed, each test person assisting in this test has the current revision. _____
- [2] **OBTAIN** copies of the applicable forms from the latest revision of SMP-9.0, **AND**

ATTACH to this PTI for use during the performance of this PTI. _____

NOTE

Instrument inaccuracies are based on information from the Unit 1 SSDs. Ensure instrument inaccuracies match the Unit 2 SSDs.

- [3] **ENSURE** changes to the references listed on “Test Procedure and Instruction Reference Review”, Appendix A, have been reviewed, and determined **NOT** to adversely affect the test performance. _____
- [4] **VERIFY** current revisions and change paper for referenced drawings has been reviewed and determined NOT to adversely affect the test performance, **AND**

ATTACH documentation of current drawing revision numbers and change paper that were reviewed to the data package. _____
- [5] **EVALUATE** items on Open Watts Bar Integrated Task Equipment List (WITEL) **AND**

ENSURE that they will **NOT** adversely affect the test performance. _____
- [6] **ENSURE** required Component Testing has been completed prior to start of test. _____

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4.1 Preliminary Actions (continued)

[7] **ENSURE** outstanding Design Change Notices (DCN's), Engineering Design Change Requests (EDCR's) or Temporary Alterations (TA's) do **NOT** adversely impact testing. _____

[8] **ENSURE** a review of outstanding Clearances has been coordinated with U2 Operations for impact to the test performance, **AND**
RECORD in Appendix B, Temporary Condition Log if required. _____

[9] **VERIFY** System cleanliness as required for the performance of this test has been completed in accordance with SMP-7.0. _____

[10] **ENSURE** plant instruments, listed on Appendix C, Permanent Plant Instrumentation Log, are placed in service and are within their calibration interval.
Subsection 6.3 _____

[11] **VERIFY** Measuring and Test Equipment (M&TE) required for test performance has been (as required) filled, vented, place in service and recorded on Measuring and Test Equipment Log.
Subsection 6.2 _____
Subsection 6.3 _____
Subsection 6.4 _____

[12] **ENSURE** Measuring and Test Equipment (M&TE) calibration due dates will support the completion of this test performance.
Subsection 6.2 _____
Subsection 6.3 _____
Subsection 6.4 _____

[13] **ENSURE** System 55, Annunciator and Sequential Events Recording System applicable TBK switches are ON, the applicable Master Switches are ON, and window software input (s) are ENABLED for the following Annunciator windows.
A. 2-XA-55-5B/101-A _____
B. 2-XA-55-5B/101-B _____

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4.1 Preliminary Actions (continued)

C. 2-XA-55-5B/101-C _____

D. 2-XA-55-6F/148-B _____

[14] **ENSURE** components contained within the boundaries of this test are under the jurisdictional control of Preoperational Startup Engineering (PSE) in accordance with SMP-4.0. _____

[15] **PERFORM** a pretest walkdown on equipment to be tested to ensure no conditions exist that will impact test performance. _____

[16] **CONDUCT** a pretest briefing with Test and Operations personnel in accordance with SMP-9.0. _____

[17] **ENSURE** supports required for System 81 testing are in place or an equivalent engineering approved temporary support is installed.
Subsection 6.3 _____

[18] **ENSURE** Stand Pipe connection from Seal 3 leak off on RCP's 1-4 has blank off plate installed.
Subsection 6.4 _____

[19] **ENSURE** the following Integrated Computer System (ICS) points are in scan:
A. 03/007, 101-A PWST LEVEL LO (LS-81-1A). _____

B. 03/014, 101-A PWST LEVEL HI (LS-81-1E). _____

[20] **ENSURE** the PWST level is greater than 25 feet as read on 2-LI-81-1A (PANEL 2-M-5). _____

[21] **ENSURE** 2-MCC-214-A1-A, 480V Control and Auxiliary Building Vent Board 2A1-A is energized. _____

[22] **ENSURE** 2-MCC-214-B1-B, 480V Control and Auxiliary Building Vent Board 2B1-B is energized. _____

[23] **ENSURE** 0-BD-236-3, 125VDC Vital Battery Board III is energized. _____

[24] **ENSURE** 0-BD-236-4, 125VDC Vital Battery Board IV is energized. _____

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4.1 Preliminary Actions (continued)

[25] **ESTABLISH** communications between areas where testing is to be conducted:

- A. Main Control Room (Panel 2-M-5) and 2-FCV-81-13, 2-FCV-81-14, 2-FCV-81-15, and 2-FCV-81-16

Subsection 6.1 _____

- B. Main Control Room (panel 2-M-5) Auxiliary control Room Panels 2-L-10 and 2-L-11A, and 2-FCV-81-12

Subsection 6.2 _____

- C. Main Control Room (Panel 2-M-5) Primary Makeup Water Pumps, and 2-PCV-81-10

Subsection 6.3 _____

- D. Main Control Room (Panel 2-M-5) and Auxiliary control Room Panels 2-L-11A

Subsection 6.3 _____

4.2 Tools, Measuring and Test Equipment, Parts, and Supplies

[1] The following M&TE are available:

- A. Two Digital Stopwatches with an accuracy of ± 1.5 sec/hr.

- B. 0 to 200 gpm Ultrasonic flowmeter ($\pm 3\%$ of range)

Subsection 6.3 _____

Subsection 6.4 _____

[2] The following is available:

- A. One jumper _____

4.3 Field Preparations

[1] **ENSURE** the following systems are operational and have been placed in service to the extent necessary to perform this test:

- A. System 59, Demineralized Water Supply water to PWST.

Subsection 6.3 _____

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4.3 Field Preparations (continued)

B. System 32, Control air to all AOVs _____

C. System 959, Demin Water Storage and Distribution system for Makeup Water to PWST.
Subsection 6.3 _____

[2] **PERFORM** the Breaker/ Fuse Lineup listed in Appendix D. _____

[3] **PERFORM** the following steps to align valves for testing.
Steps 4.3[3]A and 4.3[3]B may be performed simultaneously.
Subsection 6.3.

A. **RECORD** the As Found position of the valves listed in Appendix F _____

B. **ALIGN** Valves as listed in Appendix F _____

[4] **OBTAIN** the appropriate System Test Engineers approval for the performance of
Subsection 6.4.

A. System 62, Chemical and Volume Control _____

B. System 68, Reactor Coolant _____

C. System 77, Waste Disposal _____

[5] **INSTALL** a temporary hose downstream of valve 2-RTV-81-0200A, ROOT VLV TO LG-81-1, and run to a suitable drain.
Subsection 6.3 _____

[6] **INSTALL** a temporary hose downstream of valve 0-ISV-81-515, SPARE, and run to a suitable drain.
Subsection 6.4 _____

[7] **ENSURE** System 81, Primary Makeup Water System is filled and vented per 0-SOI-81.01.
Subsection 6.3 _____

[8] **PERFORM** the Handswitch Lineup listed in Appendix E. _____

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4.3 Field Preparations (continued)

[9] **IF** Plastic screws and washers at the Vendor Terminals TB-610-9 and TB-610-10 in Panel 2-R-48 are already installed, **THEN**

MARK Steps 4.3[10] and 7.0[4] as **NA**. _____

[10] **ENSURE** that Plastic screws and washers at the Vendor Terminals TB-610-9 and TB-610-10 in Panel 2-R-48 are installed. _____

4.4 Approvals and Notifications

[1] **PRIOR** to the start of this test, **OBTAIN** permission of the Preoperational Startup Manager to start the test.

Preoperational Startup Manager

Date

[2] **PRIOR** to the start of the test, **OBTAIN** the Unit 2 US/SRO or Shift Manager (SM) authorization.

US/SRO/SM

Date

[3] **PRIOR** to the start of the test, **OBTAIN** the Unit 1 US/SRO or Shift Manager (SM) authorization.

US/SRO/SM

Date

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5.0 ACCEPTANCE CRITERIA

NOTE

Design hydraulic performance characteristics require a Total Developed Head (TDH) of greater than or equal to 215 feet at greater than or equal to 150 gpm. To account for instrument inaccuracy the Acceptance Criteria for TDH will be increased by 6 feet $(2+.5)*2.31$. The requirement for flow should be adjusted based on the accuracy of M&TE used for the test.

- [1] The Primary Makeup Pumps meet or exceed the design hydraulic performance characteristics.
 - A. Primary Makeup Pump 2A (2-PMP-81-3) develops a TDH of greater than or equal to 221 feet at greater than or equal to 150 gpm. (Step 6.3[31])
 - B. Primary Makeup Pump 2B (2-PMP-81-7) develops a TDH of greater than or equal to 221 feet at greater than or equal to 150 gpm. (Step 6.3[40])

- [2] The Primary Makeup Pumps (With handswitch in PULL P Auto) will start when header pressure decreases below low pressure setpoint provided PWST level is less than low level setpoint. (Step 6.3[35] and 6.3[46])

- [3] The Primary Makeup Pumps stops when PWST level decreases below low level setpoint. (Step 6.3[49]A and 6.3[66])

- [4] The Primary Makeup Pumps can deliver flow at the crossover isolation valve between Unit 1 and Unit 2 to demonstrate ability to supply transfer of tank contents from one tank to the other. (Step 6.4[10] and 6.4[16])

- [5] Primary Makeup Water can be supplied to all required locations as defined in Appendix G, Flow Verification Checklist, for Unit 2. (Step 6.4[31] and Appendix G)

- [6] Controls and interlocks function properly in response to normal input signals.
 - A. 2-FCV-81-12, PW RCS PRESS RELIEF TANK & RCP STANDPIPES, closes in less than or equal to 10 seconds. (Steps 6.2[24]A and 6.2[24]B)
 - B. 2-FCV-81-12, PW RCS PRESS RELIEF TANK & RCP STANDPIPES, closes upon a Phase A Containment Isolation signal. (step 6.2[37])

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5.0 ACCEPTANCE CRITERIA (continued)

- C. 2-FCV-81-13, RCP NO 1 STANDPIPE MAKEUP WATER, closes in less than or equal to 10 seconds. (Steps 6.1[7]A and 6.1[7]B)
 - D. 2-FCV-81-14, RCP NO 2 STANDPIPE MAKEUP WATER, closes in less than or equal to 10 seconds. (Steps 6.1[25]A and 6.1[25]B)
 - E. 2-FCV-81-15, RCP NO 3 STANDPIPE MAKEUP WATER, closes in less than or equal to 10 seconds. (Steps 6.1[43]A and 6.1[43]B)
 - F. 2-FCV-81-16, RCP NO 4 STANDPIPE MAKEUP WATER, closes in less than or equal to 10 seconds. (Steps 6.1[61]A and 6.1[61]B)
- [7] 2-PCV-81-10, PW RECIRC CONT, Modulates between 105 psig and 110 psig (Step 6.3[7])
- [8] 2-LT-81-1, PRIMARY WATER STORAGE TANK LEVEL, High and Low level instrumentation responds and alarms per setpoints. (Step 6.3[78] and 6.3[80])

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6.0 PERFORMANCE

NOTES
1) Reset stopwatches before performing the second timed stroke on valves. 2) Observe Primary Water Pump Motors to ensure overheating does not occur.

6.1 RCP Standpipe Fill Valves, 2-FCV-81-13, 14, 15, and 16

- [1] **ENSURE** prerequisites listed in Section 4.0 for subsection 6.1 have been completed. _____
- [2] **PLACE** 2-HS-81-13 [2-M-5], PW TO RCP 1 STANDPIPE, to the OPEN position. _____
- [3] **VERIFY** 2-FCV-81-13, RCP NO 1 STANDPIPE MAKEUP WATER, is OPEN as follows:
 - A. Red Light ON (2-HS-81-13) _____
 - B. Green Light OFF (2-HS-81-13) _____
 - C. 2-FCV-81-13 OPEN (locally) _____
- [4] **PLACE** 2-HS-81-13, PW TO RCP 1 STANDPIPE, to the CLOSE position. _____
- [5] **VERIFY** 2-FCV-81-13, RCP NO 1 STANDPIPE MAKEUP WATER, is CLOSED as follows:
 - A. Green Light ON (2-HS-81-13) _____
 - B. Red Light OFF (2-HS-81-13) _____
 - C. 2-FCV-81-13 CLOSED (locally) _____

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6.1 RCP Standpipe Fill Valves, 2-FCV-81-13, 14, 15, and 16 (continued)

[6] **PLACE** 2-HS-81-13, PW TO RCP 1 STANDPIPE, to the OPEN position. _____

A. **RECORD** remote opening time at 2-HS-81-13.
_____ seconds

M&TE _____ Cal Due Date _____

B. **RECORD** local opening time at 2-FCV-81-13.
_____ seconds

M&TE _____ Cal Due Date _____

[7] **PLACE** 2-HS-81-13, PW TO RCP 1 STANDPIPE, to the CLOSE position. _____

A. **RECORD** remote closing time at 2-HS-81-13. **[ACC CRIT]**
_____ seconds (≤10 sec.)

M&TE _____ Cal Due Date _____

B. **RECORD** local closing time at 2-FCV-81-13. **[ACC CRIT]**
_____ seconds (≤10 sec.)

M&TE _____ Cal Due Date _____

[8] **PLACE** 2-HS-81-13, PW TO RCP 1 STANDPIPE, to the OPEN position. _____

[9] **CLOSE** 2-ISV-32-3630 [RB AZ 50 702], CONTROL AIR ISOLATION VALVE TO 2-FCV-81-13. _____

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**6.1 RCP Standpipe Fill Valves, 2-FCV-81-13, 14, 15, and 16
(continued)**

- [10] **OPEN** the air regulator drain valve for 2-FCV-81-13. _____
 - [11] **VERIFY**, locally, 2-FCV-81-13, RCP NO 1 STANDPIPE MAKEUP WATER, fails CLOSED. _____
 - [12] **CLOSE** the air regulator drain valve for 2-FCV-81-13. _____
 - [13] **OPEN** 2-ISV-32-3630, CONTROL AIR ISOLATION VALVE TO 2-FCV-81-13. _____
 - [14] **VERIFY**, locally, 2-FCV-81-13, RCP NO 1 STANDPIPE MAKEUP WATER, OPENS. _____
 - [15] **REMOVE** fuse 0-FU-236-0003/D33 in 125VDC BATT BD III CKT D33. _____

- CV
- [16] **VERIFY**, locally, 2-FCV-81-13, PRIMARY WATER TO RCP 1 STANDPIPE, CLOSES. _____

NOTE

The Fuse in the following step has a blown Fuse indicator which must be oriented towards the Annunciator Circuit.

- [17] **INSTALL** Fuse 0-FU-236-0003/D33 IN 125VDC BATT BD III, CKT D33. _____

- CV
- [18] **VERIFY**, locally, 2-FCV-81-13, PRIMARY WATER TO RCP 1 STANDPIPE, OPENS. _____
 - [19] **PLACE** 2-HS-81-13, PW TO RCP 1 STANDPIPE, to the CLOSE position. _____
 - [20] **PLACE** 2-HS-81-14, PW TO RCP 2 STANDPIPE, to the OPEN position. _____

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**6.1 RCP Standpipe Fill Valves, 2-FCV-81-13, 14, 15, and 16
(continued)**

[21] **VERIFY** 2-FCV-81-14 [RB AZ130 722], RCP NO 2 STANDPIPE MAKEUP WATER, is OPEN as follows:

- A. Red Light ON (2-HS-81-14) _____
- B. Green Light OFF (2-HS-81-14) _____
- C. 2-FCV-81-14 OPEN (locally) _____

[22] **PLACE** 2-HS-81-14, PW TO RCP 2 STANDPIPE, to the CLOSE position. _____

[23] **VERIFY** 2-FCV-81-14, RCP NO 2 STANDPIPE MAKEUP WATER, is CLOSED as follows:

- A. Green Light ON (2-HS-81-14) _____
- B. Red Light OFF (2-HS-81-14) _____
- C. 2-FCV-81-14 CLOSED (locally) _____

[24] **PLACE** 2-HS-81-14, PW TO RCP 2 STANDPIPE, to the OPEN position. _____

- A. **RECORD** remote opening time at 2-HS-81-14.
_____ seconds _____

M&TE _____ Cal Due Date _____

- B. **RECORD** local opening time at 2-FCV-81-14.
_____ seconds _____

M&TE _____ Cal Due Date _____

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**6.1 RCP Standpipe Fill Valves, 2-FCV-81-13, 14, 15, and 16
(continued)**

[25] **PLACE** 2-HS-81-14, PW TO RCP 2 STANDPIPE, to the CLOSE position. _____

A. **RECORD** remote closing time at 2-HS-81-14. **[ACC CRIT]**

_____ seconds (≤10 sec.)

M&TE _____ Cal Due Date _____

B. **RECORD** local closing time at 2-FCV-81-14. **[ACC CRIT]**

_____ seconds (≤10 sec.)

M&TE _____ Cal Due Date _____

[26] **PLACE** 2-HS-81-14, PW TO RCP 2 STANDPIPE, to the OPEN position. _____

[27] **CLOSE** 2-ISV-32-3651 [RB AZ130 702], CONTROL AIR ISOLATION VALVE TO 2-FCV-81-14. _____

[28] **OPEN** the regulator drain valve for 2-FCV-81-14. _____

[29] **VERIFY** locally 2-FCV-81-14, RCP NO 2 STANDPIPE MAKEUP WATER, fails CLOSED. _____

[30] **CLOSE** the regulator drain valve for 2-FCV-81-14. _____

[31] **OPEN** 2-ISV-32-3651, CONTROL AIR ISOLATION VALVE TO 2-FCV-81-14. _____

[32] **VERIFY** locally 2-FCV-81-14, RCP NO 2 STANDPIPE MAKEUP WATER, OPENS. _____

[33] **REMOVE** Fuse 0-FU-236-0004/D34 in 125VDC BATT BD IV CKT D34. _____

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**6.1 RCP Standpipe Fill Valves, 2-FCV-81-13, 14, 15, and 16
(continued)**

[34] **VERIFY**, locally, 2-FCV-81-14, PRIMARY WATER TO RCP 2 STANDPIPE, CLOSES. _____

NOTE

The Fuse in the following step has a blown Fuse indicator which must be oriented towards the Annunciator Circuit.

[35] **INSTALL** Fuse 0-FU-236-0004/D34 IN 125VDC BATT BD IV, CKT D34. _____

CV

[36] **VERIFY**, locally, 2-FCV-81-14, PRIMARY WATER TO RCP 2 STANDPIPE, OPENS. _____

[37] **PLACE** 2-HS-81-14, PW TO RCP 2 STANDPIPE, in the CLOSE position. _____

[38] **PLACE** 2-HS-81-15, PW TO RCP 3 STANDPIPE, to the OPEN position. _____

[39] **VERIFY** 2-FCV-81-15 [RB AZ 722], RCP NO 3 STANDPIPE MAKEUP WATER, is OPEN as follows:

A. Red Light ON (2-HS-81-15) _____

B. Green Light OFF (2-HS-81-15) _____

C. 2-FCV-81-15 OPEN (locally) _____

[40] **PLACE** 2-HS-81-15, PW TO RCP 3 STANDPIPE, to the CLOSE position. _____

[41] **VERIFY** 2-FCV-81-15, RCP NO 3 STANDPIPE MAKEUP WATER, is CLOSED as follows:

A. Green Light ON (2-HS-81-15) _____

B. Red Light OFF (2-HS-81-15) _____

C. 2-FCV-81-15 CLOSED (locally) _____

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6.1 RCP Standpipe Fill Valves, 2-FCV-81-13, 14, 15, and 16 (continued)

[42] **PLACE** 2-HS-81-15, PW TO RCP 3 STANDPIPE, to the OPEN position. _____

A. **RECORD** remote opening time at 2-HS-81-15.
_____ seconds

M&TE _____ Cal Due Date _____

B. **RECORD** local opening time at 2-FCV-81-15.
_____ seconds

M&TE _____ Cal Due Date _____

[43] **PLACE** 2-HS-81-15, PW TO RCP 3 STANDPIPE, to the CLOSE position. _____

A. **RECORD** remote closing time at 2-HS-81-15. **[ACC CRIT]**
_____ seconds (≤10 sec.)

M&TE _____ Cal Due Date _____

B. **RECORD** local closing time at 2-FCV-81-15. **[ACC CRIT]**
_____ seconds (≤10 sec.)

M&TE _____ Cal Due Date _____

[44] **PLACE** 2-HS-81-15, PW TO RCP 3 STANDPIPE, to the OPEN position. _____

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**6.1 RCP Standpipe Fill Valves, 2-FCV-81-13, 14, 15, and 16
(continued)**

- [45] **CLOSE** 2-ISV-32-3598 [RB AZ220 702], CONTROL AIR ISOLATION VALVE TO 2-FCV-81-15. _____
- [46] **OPEN** the regulator drain valve for 2-FCV-81-15. _____
- [47] **VERIFY** locally 2-FCV-81-15, RCP NO 3 STANDPIPE MAKEUP WATER, fails CLOSED. _____
- [48] **CLOSE** the regulator drain valve for 2-FCV-81-15. _____
- [49] **OPEN** 2-ISV-32-3598, CONTROL AIR ISOLATION VALVE TO 2-FCV-81-15. _____
- [50] **VERIFY** locally 2-FCV-81-15, RCP NO 3 STANDPIPE MAKEUP WATER, OPENS. _____
- [51] **REMOVE** Fuse 0-FU-236-0003/E34 in 125VDC BATT BD III CKT E34. _____

- CV
- [52] **VERIFY**, locally, 2-FCV-81-15, PRIMARY WATER TO RCP 3 STANDPIPE, CLOSES. _____

NOTE

The Fuse in the following step has a blown Fuse indicator which must be oriented towards the Annunciator Circuit.

- [53] **INSTALL** Fuse 0-FU-236-0003/E34 IN 125VDC BATT BD III, CKT E34. _____

- CV
- [54] **VERIFY**, locally, 2-FCV-81-15, PRIMARY WATER TO RCP 3 STANDPIPE, OPENS. _____
- [55] **PLACE** 2-HS-81-15, PW TO RCP 3 STANDPIPE, to the CLOSE position. _____
- [56] **PLACE** 2-HS-81-16, PW TO RCP 4 STANDPIPE, to the OPEN position. _____

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6.1 RCP Standpipe Fill Valves, 2-FCV-81-13, 14, 15, and 16 (continued)

[57] **VERIFY** 2-FCV-81-16 [RB AZ305 702], RCP NO 4 STANDPIPE MAKEUP WATER, is OPEN as follows:

- A. Red Light ON (2-HS-81-16) _____
- B. Green Light OFF (2-HS-81-16) _____
- C. 2-FCV-81-16 OPEN (locally) _____

[58] **PLACE** 2-HS-81-16, PW TO RCP 4 STANDPIPE, to the CLOSE position. _____

[59] **VERIFY** 2-FCV-81-16, RCP NO 4 STANDPIPE MAKEUP WATER, is CLOSED as follows:

- A. Green Light ON (2-HS-81-16) _____
- B. Red Light OFF (2-HS-81-16) _____
- C. 2-FCV-81-16 CLOSED (locally) _____

[60] **PLACE** 2-HS-81-16, PW TO RCP 4 STANDPIPE, to the OPEN position. _____

- A. **RECORD** remote opening time at 2-HS-81-16.
_____ seconds

M&TE _____ Cal Due Date _____

- B. **RECORD** local opening time at 2-FCV-81-16.
_____ seconds

M&TE _____ Cal Due Date _____

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**6.1 RCP Standpipe Fill Valves, 2-FCV-81-13, 14, 15, and 16
(continued)**

[61] **PLACE** 2-HS-81-16, PW TO RCP 4 STANDPIPE, to the CLOSE position. **[ACC CRIT]** _____

A. **RECORD** remote closing time at 2-HS-81-16. **[ACC CRIT]**

_____ seconds (≤10 sec.)

M&TE _____ Cal Due Date _____

B. **RECORD** local closing time at 2-FCV-81-16. **[ACC CRIT]**

_____ seconds (≤10 sec.)

M&TE _____ Cal Due Date _____

[62] **PLACE** 2-HS-81-16, PW TO RCP 4 STANDPIPE, to the OPEN position. _____

[63] **CLOSE** 2-ISV-32-3535 [RB AZ315 702], CONTROL AIR ISOLATION VALVE TO 2-FCV-81-16. _____

[64] **OPEN** the regulator drain valve for 2-FCV-81-16. _____

[65] **VERIFY** locally 2-FCV-81-16, RCP NO 4 STANDPIPE MAKEUP WATER, fails CLOSED. _____

[66] **CLOSE** the regulator drain valve for 2-FCV-81-16. _____

[67] **OPEN** 2-ISV-32-3535, CONTROL AIR ISOLATION VALVE TO 2-FCV-81-16. _____

[68] **VERIFY** locally 2-FCV-81-16, RCP NO 4 STANDPIPE MAKEUP WATER, OPENS. _____

[69] **REMOVE** Fuse 0-FU-236-0004/D35 in 125VDC BATT BD IV CKT D35. _____

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**6.1 RCP Standpipe Fill Valves, 2-FCV-81-13, 14, 15, and 16
(continued)**

[70] **VERIFY**, locally, 2-FCV-81-16, PRIMARY WATER TO RCP 4
STANDPIPE, CLOSES.

NOTE

The Fuse in the following step has a blown Fuse indicator which must be oriented towards the Annunciator Circuit.

[71] **INSTALL** Fuse 0-FU-236-0004/D35 IN 125VDC BATT BD IV,
CKT D35.

CV

[72] **VERIFY**, locally, 2-FCV-81-16, PRIMARY WATER TO RCP 3
STANDPIPE, OPENS.

[73] **PLACE** 2-HS-81-16, PW TO RCP 4 STANDPIPE, to the
CLOSE position.

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6.2 PRT & RCP Standpipes Isol, 2-FCV-81-12 Logic Test

- [1] **ENSURE** prerequisites listed in Section 4.0 for Subsection 6.2 have been completed. _____
- [2] **INSTALL** a jumper across Terminals TB-610-9 and TB-610-10 in Panel 2-R-48 on the field side of the plastic isolators. _____

- CV
- [3] **ENSURE** 2-XS-81-12 [2-L-11A], PW RCS PRESS RELIEF TK & STANDPIPES, is in the NORMAL position. _____
- [4] **ENSURE** 2-HS-81-12C [2-L-10], PW TO RCP STANDPIPES, is in the CLOSE position. _____
- [5] **ENSURE** 2-HS-81-12A [2-M-5], PRIMARY WATER TO PRT & STANDPIPE, is in the CLOSE position. _____
- [6] **VERIFY** the following light indicators:
 - A. Red light OFF (2-HS-81-12A) _____
 - B. Green light ON (2-HS-81-12A) _____
 - C. CISP-2-XX-55-6E, Window 107, FCV-81-12, Red Light OFF _____
 - D. CISP-2-XX-55-6E, Window 107, FCV-81-12, Green Light ON _____
- [7] **PLACE** 2-HS-81-12C, PW TO RCP STANDPIPES, to the OPEN position. _____
- [8] **VERIFY** 2-FCV-81-12 [AB ELE 713 (BIT RM)], PW RCS PRESS RELIEF TANK & RCP STANDPIPES, does **NOT** OPEN. _____
- [9] **PLACE** and **HOLD** 2-HS-81-12A, PRIMARY WATER TO PRT & STANDPIPES, to the OPEN position until 2-HS-81-12A Green Light is OFF. _____

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6.2 PRT & RCP Standpipes Isol, 2-FCV-81-12 Logic Test (continued)

- [10] **VERIFY** the following OPEN indications:
 - A. Red Light ON (2-HS-81-12A) _____
 - B. Green Light OFF (2-HS-81-12A) _____
 - C. CISP-2-XX-55-6E, Window 107, FCV-81-12, Red Light ON _____
 - D. CISP-2-XX-55-6E, Window 107, FCV-81-12, Green Light OFF _____

- [11] **PLACE** 2-HS-81-12C, PW TO RCP STANDPIPES, to the CLOSE POSITION. _____

- [12] **VERIFY** 2-FCV-81-12, PW RCS PRESS RELIEF TANK & RCP STANDPIPES, does **NOT** CLOSE. _____

- [13] **PLACE** 2-HS-81-12A, PRIMARY WATER TO PRT & STANDPIPES, to the CLOSE position. _____

- [14] **VERIFY** the following CLOSED indications:
 - A. Red Light OFF (2-HS-81-12A) _____
 - B. Green Light ON (2-HS-81-12A) _____
 - C. CISP-2-XX-55-6E, Window 107, FCV-81-12, Red Light OFF _____
 - D. CISP-2-XX-55-6E, Window 107, FCV-81-12, Green Light ON _____

- [15] **ENSURE** Window 148-B, ACR PNL 2-L-11A, is CLEAR. _____

- [16] **PLACE** 2-XS-81-12, PW RCS PRESS RELIEF TK & STANDPIPES, to the AUX position. _____

- [17] **ENSURE** Window 148-B, ACR PNL 2-L-11A, ALARMS. _____

- [18] **PLACE** and **HOLD** 2-HS-81-12A, PRIMARY WATER TO PRT & STANDPIPES, to the OPEN position. _____

- [19] **VERIFY** 2-FCV-81-12, PW RCS PRESS RELIEF TK & RCP STANDPIPES, does **NOT** OPEN. _____

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6.2 PRT & RCP Standpipes Isol, 2-FCV-81-12 Logic Test (continued)

[20] **RELEASE** 2-HS-81-12A, PRIMARY WATER TO PRT & STANDPIPES. _____

[21] **PLACE** 2-HS-81-12C, PW TO RCP STANDPIPES, to the OPEN position. _____

A. **RECORD** remote opening time at 2-HS-81-12C.
_____ seconds

M&TE _____ Cal Due Date _____

B. **RECORD** local opening time at 2-FCV-81-12.
_____ seconds

M&TE _____ Cal Due Date _____

[22] **PLACE** 2-HS-12A, PRIMARY WATER TO PRT & STANDPIPES, to the CLOSE position. _____

[23] **VERIFY** 2-FCV-81-12, PW RCS PRESS RELIEF TANK & RCP STANDPIPES, does **NOT** CLOSE. _____

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6.2 PRT & RCP Standpipes Isol, 2-FCV-81-12 Logic Test (continued)

[24] **PLACE** 2-HS-81-12C, PW TO RCP STANDPIPES, to the CLOSE position. _____

A. **RECORD** remote closing time at 2-FCV-81-12. **[ACC CRIT]**
_____ seconds (≤10 sec.)

M&TE _____ Cal Due Date _____

B. **RECORD** local closing time at 2-FCV-81-12. **[ACC CRIT]**
_____ seconds (≤10 sec.)

M&TE _____ Cal Due Date _____

[25] **PLACE** 2-HS-81-12C, PW TO RCP STANDPIPES, to the OPEN position. _____

[26] **VERIFY** 2-FCV-81-12, PW RCS PRESS RELIEF TANK & STANDPIPES, OPENS.

A. Green Light OFF (2-HS-81-12C) _____

B. Red Light ON (2-HS-81-12C) _____

[27] **CLOSE** 2-ISV-32-3177, CONTROL AIR ISOLATION VALVE TO 2-FCV-81-12. _____

[28] **OPEN** the regulator drain valve for 2-FCV-81-12. _____

[29] **VERIFY** 2-FCV-81-12, PW RCS PRESS RELIEF TANK & RCP STANDPIPES, fails CLOSED.

A. Green Light ON (2-HS-81-12C) _____

B. Red Light OFF (2-HS-81-12C) _____

[30] **CLOSE** the regulator drain valve for 2-FCV-81-12. _____

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6.2 PRT & RCP Standpipes Isol, 2-FCV-81-12 Logic Test (continued)

- [31] **OPEN** 2-ISV-32-3177, CONTROL AIR ISOLATION VALVE TO 2-FCV-81-12. _____
- [32] **VERIFY** 2-FCV-81-12, PW RCS PRESS RELIEF TANK & RCP STANDPIPES, OPENS. _____
- [33] **PLACE** 2-HS-81-12A, PRIMARY WATER TO PRT & STANDPIPES, in the A AUTO position. _____
- [34] **PLACE** 2-XS-81-12, PW RCS PRESS RELIEF TANK & STANDPIPES, to the NORMAL position. _____
- [35] **ENSURE** Window 148-B, ACR PNL 2-L-11A CLEARS. _____

NOTE

The following step simulates a Phase A Containment Isolation signal.

- [36] **REMOVE** the jumper installed across Terminals TB-610-9 and TB-610-10 in Panel 2-R-48. _____
_____ CV
- [37] **VERIFY** 2-FCV-81-12, PW RCS PRESS RELIEF TANK & RCP STANDPIPES, CLOSES to its fail safe position of closed. **[ACC CRIT]** _____
- [38] **PLACE** and **HOLD** 2-HS-81-12A, PRIMARY WATER TO PRT & STANDPIPES, to the OPEN position until only the Red Light is ON. _____
- [39] **RELEASE** 2-HS-81-12A, PRIMARY WATER TO PRT & STANDPIPES, and **VERIFY** 2-FCV-81-12, PW RCS PRESS RELIEF TANK & RCP STANDPIPES, goes CLOSED. _____
- [40] **INSTALL** the jumper across Terminals TB-610-9 and TB-610-10 on the field side of the plastic isolators in Panel 2-R-48. _____
_____ CV

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6.2 PRT & RCP Standpipes Isol, 2-FCV-81-12 Logic Test (continued)

[41] **VERIFY** Valve 2-FCV-81-12, PW RCS PRESS RELIEF TANK & RCP STANDPIPES, remains CLOSED. _____

[42] **PLACE** and **HOLD** 2-HS-81-12A, PRIMARY WATER TO PRT & STANDPIPES, to the OPEN position until only the Red Light is ON. _____

[43] **REMOVE** Fuse 0-FU-236-3/A20 in 125VDC Battery Board III, Circuit A20 _____

CV

[44] **VERIFY**, locally, 2-FCV-81-12, PW RCS PRESS RELIEF TANK & RCP STANDPIPES, CLOSES. _____

NOTE

The Fuse in the following step has a blown Fuse indicator which must be oriented towards the Annunciator Circuit.

[45] **INSTALL** Fuse 0-FU-236-3/A20 in 125VDC Battery Board III, Circuit A20. _____

CV

[46] **VERIFY**, locally, 2-FCV-81-12, PW RCS RELIEF TANK & RCP STANDPIPES remains CLOSED. _____

[47] **REMOVE** the jumper installed across Terminals TB-610-9 and TB-610-10. _____

CV

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6.3 PMW Pumps Logic

NOTES

- 1) The following steps require cycling the PMW Pump motors. Limit pump cycling to two cold starts or one hot start per hour.
- 2) Pump piping vibration is to be visually monitored in accordance with the N3C-945, Appendix A guidelines during the pump start transient. Any excessive vibration will result in a Test Deficiency Notice (TDN) with engineering evaluation as part of the TDN closure.

[1] **ENSURE** prerequisites listed in Section 4.0 for Subsection 6.3 have been completed. _____

A. **ENSURE** 2-MCC-214-A1, COMPT 2D, PRIMARY MAKEUP WATER PUMP 2A (2-PMP-81-3), is CLOSED. _____

B. **ENSURE** 2-MCC-214-B1, COMPT 2D, PRIMARY MAKEUP WATER PUMP 2B (2-PMP-81-7), is CLOSED. _____

C. **ENSURE** 2-HS-81-3A [2-M-5], PRIMARY WATER PMP A, is in the IN-MANUAL (NORMAL AFTER STOP) position. _____

D. **ENSURE** 2-HS-81-7A [2-M-5], PRIMARY WATER PMP B, is in the IN-MANUAL (NORMAL AFTER STOP) position. _____

E. **INSTALL** a jumper across Terminals TB-610-9 and TB-610-10 in Panel 2-R-48 on the field side of the plastic isolators. _____

CV

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6.3 PMW Pumps Logic (continued)

- [2] **VERIFY** the following light indications at MCB, 2-M-5, for Primary Makeup Water Pumps 2A and 2B:
 - A. Red Light is OFF (2-HS-81-3A). _____
 - B. Green Light is ON (2-HS-81-3A). _____
 - C. Red Light is OFF (2-HS-81-7A). _____
 - D. Green Light is ON (2-HS-81-7A). _____
- [3] **VERIFY**, locally, 2-PCV-81-10, PW RECIRC CONT, is CLOSED. _____
- [4] **PLACE** 2-HS-81-3A [2-M-5], PRIMARY WATER PMP A, to the START position. _____
- [5] **VERIFY** the following light indications:
 - A. Red Light is ON (2-HS-81-3A). _____
 - B. Green Light is OFF (2-HS-81-3A). _____
- [6] **VERIFY**, locally, PMW Pump 2A is running. _____
- [7] **VERIFY** 2-PCV-81 PW RECIRC CONT, is modulating to control header pressure between 105 to 110 psig, as read on 2-PI-81-4, PW MAKEUP PUMP A OUTLET [**ACC CRIT**], and **RECORD** pressure. _____ psig _____
- [8] **VERIFY** Window 101-B, PRI WTR HDR PRESS HI, is CLEAR. _____

CAUTION

The next steps increase system pressure to verify the system High Pressure Alarm. Header pressure should **NOT** be allowed to exceed 120 psig.

- [9] **THROTTLE CLOSED** 2-BYV-81-510, PMWS PUMP RECIRC ISLN, until Window 101-B ALARMS. _____

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Date _____

6.3 PMW Pumps Logic (continued)

[10] **RECORD** pressure indicated on 2-PI-81-4, PW MAKEUP PUMP A OUTLET.

_____ psig _____

[11] **OPEN** 2-BYV-81-510, PMWS PUMPS RECIRC ISLN.

[12] **VERIFY** Window 101-B, PRI WTR HDR PRESS HI, CLEARS.

NOTE

The following sequence of steps verifies the header Low Pressure Alarm.

[13] **VERIFY** Window 101-C, PRI WTR HDR PRESS LO, is **CLEAR**.

[14] **PRESS** 2-HS-81-3B [A2T/692], PW MAKEUP PUMP A CONT, STOP pushbutton.

[15] **VERIFY** the following light indications:

A. Red Light is OFF (2-HS-81-3A).

B. Green Light is ON (2-HS-81-3A).

[16] **VERIFY**, locally, PMW Pump 2A is **NOT** running.

[17] **VERIFY** Window 101-C, PRI WTR HDR PRESS LO, has **ALARMED**.

[18] **PLACE** 2-HS-81-7A [2-M-5], PRIMARY WATER PMP B, to the **START** position.

[19] **VERIFY** the following light indications:

A. Red Light is ON (2-HS-81-7A).

B. Green Light is OFF (2-HS-81-7A).

[20] **VERIFY**, locally, PMW Pump 2B is running.

[21] **VERIFY** Window 101-C, PRI WTR HDR PRESS LO, **CLEARS**.

[22] **PRESS** 2-HS-81-7B [A2T/692], PW MAKEUP PUMP B CONT, STOP pushbutton.

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Data Package: Page ____ of ____

Date _____

6.3 PMW Pumps Logic (continued)

[23] **VERIFY** the following light indications:

A. Red Light is OFF (2-HS-81-7A). _____

B. Green Light is ON (2-HS-81-7A). _____

[24] **VERIFY**, locally, PMW Pump 2B is **NOT** running. _____

[25] **INSTALL** an ultrasonic flowmeter on the 6 inch suction line over the TDAFW Pump room on elevation 692. _____

[26] **PRESS** 2-HS-81-3B [A2T/692], PW MAKEUP PUMP A CONT, START pushbutton and

VERIFY locally PMW Pump 2A STARTS. _____

[27] **WALKDOWN** the accessible portions of the PMW System, **AND**

VERIFY the steady-state piping and component vibration is acceptable. _____

[28] **THROTTLE** 2-ISV-81-508, PMWS PMP RECIRC SOV, until ultrasonic flow meter reads between 150 and 166 gpm, and

RECORD flow. _____ GPM

M&TE _____ Cal Due Date _____

[29] **RECORD** the following:

A. 2-PI-81-2 (Suction): _____ psig. _____

B. 2-PI-81-4 (Discharge): _____ psig. _____

[30] **COMPLETE** Data Sheet 1 _____

[31] **VERIFY** TDH from Data Sheet 1 for PMW Pump 2A is greater than or equal to 221 feet at greater than or equal to 150 gpm.

[ACC CRIT] _____

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Date _____

6.3 PMW Pumps Logic (continued)

[32] **PLACE** 2-HS-81-7A, PRIMARY WATER PMP B, to the PULL P AUTO position and

VERIFY locally PMW Pump 2B does **NOT** START. _____

NOTE

The following steps will require time for differential pressure across the pump to equalize.

[33] **PLACE** 2-HS-81-3A, PRIMARY WATER PMP A, to the STOP position. _____

[34] **VERIFY**, locally, PMW Pump 2A is **NOT** running. _____

[35] **VERIFY** locally PMW Pump 2B STARTS and remains running. **[ACC CRIT]** _____

[36] **OBSERVE** the PMW Pump vibration during starting, **AND** **VERIFY** vibration is not excessive. _____

[37] **THROTTLE CLOSE** 2-ISV-81-508, PMWS PMP RECIRC SOV, until ultrasonic flow meter reads between 150 and 166 gpm, and

RECORD flow: _____ gpm

M&TE _____ Cal Due Date _____

[38] **RECORD** the following:

A. 2-PI-81-6 (Suction): _____ psig. _____

B. 2-PI-81-8 (Discharge): _____ psig. _____

[39] **COMPLETE** Data Sheet 2 _____

[40] **VERIFY** TDH from Data Sheet 2 for PMW Pump 2B is greater than or equal to 221 feet at greater than or equal to 150 gpm. **[ACC CRIT]** _____

[41] **ENSURE** PWST level is between 18 feet and 28 feet 6 inches on 2-LI-81-1A, PRI WTR STG TK LVL. _____

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Data Package: Page ____ of ____ Date _____

6.3 PMW Pumps Logic (continued)

[42] **VERIFY** Window 101-A, PWST LEVEL HI/LO, is CLEAR. _____

[43] **PLACE** 2-HS-81-3A, PRIMARY WATER PMP A, in the PULL P AUTO, and

VERIFY locally PMW Pump 2A did **NOT** START. _____

NOTE

The following steps will require time for differential pressure across the pump to equalize.

[44] **PLACE** 2-HS-81-7A, PRIMARY WATER PMP B, to the STOP position. _____

[45] **VERIFY**, locally, PMW Pump 2B is **NOT** running. _____

[46] **VERIFY** locally PMW Pump 2A STARTS and remains running. **[ACC CRIT]** _____

NOTE

The following steps will simulate low PWST level.

[47] **CLOSE** 2-RTV-81-201A, PW Pipe Chase/719, ROOT VLV TO LT-81-1

[48] **OPEN**, slowly, the drain valve to 2-LT-81-1, PRIMARY WATER STORAGE TANK LEVEL. _____

[49] **VERIFY** the following:

A. PMW Pump 2A STOPS (locally) **[ACC CRIT]** _____

B. Window 101-A, PWST LEVEL HI/LO, ALARMS _____

C. Events Display Monitor indicates 101-A PWST LEVEL LO (LS-81-1A) is in "ALARM". _____

[50] **PLACE** and **HOLD** 2-HS-81-3A, PRIMARY WATER PMP A, in START position. _____

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Date _____

6.3 PMW Pumps Logic (continued)

- [51] **VERIFY** the following light indications:
 - A. Red Light is ON (2-HS-81-3A). _____
 - B. Green Light is OFF (2-HS-81-3A). _____
- [52] **VERIFY**, locally, PMW Pump 2A is running. _____
- [53] **RELEASE** 2-HS-81-3A, PRIMARY WATER PMP A. _____
- [54] **VERIFY** the following light indications:
 - A. Red Light is OFF (2-HS-81-3A). _____
 - B. Green Light is ON (2-HS-81-3A). _____
- [55] **VERIFY**, locally, PMW Pump 2A is STOPPED. _____
- [56] **CLOSE** the drain valve to 2-LT-81-1. _____
- [57] **RETURN** 2-LT-81-1 to service. _____
- [58] **OPEN** 2-RTV-81-201A, PW Pipe Chase/719, ROOT VLV TO 2-LT-81-1 _____
- [59] **VERIFY** the following:
 - A. Window 101-A, PWST LEVEL HI/LO, has CLEARED. _____
 - B. Events Display Monitor indicates 101-A PWST LEVEL LO (LS-81-1A) is in "NORMAL". _____
- [60] **PRESS** 2-HS-81-7B, PW MAKEUP PUMP B CONT, START pushbutton. _____
- [61] **VERIFY**, locally, PMW Pump 2B is running. _____
- [62] **PLACE** 2-HS-81-7A, PRIMARY WATER PMP B, in PULL P AUTO. _____

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Data Package: Page ____ of ____ **Date _____**

6.3 PMW Pumps Logic (continued)

[63] **VERIFY** the following light indications:

A. Red Light is ON (2-HS-81-7A). _____

B. Green Light is OFF (2-HS-81-7A). _____

NOTE

The following steps will simulate low PWST level.

[64] **CLOSE** 2-RTV-81-201A, PW Pipe Chase/719, ROOT VLV TO LT-81-1 _____

[65] **OPEN**, slowly, the drain valve to 2-LT-81-1. _____

[66] **VERIFY** locally PMW Pump 2B STOPS [**ACC CRIT**] _____

[67] **PLACE** and **HOLD** 2-HS-81-7A, PRIMARY WATER PMP B, in the START position. _____

[68] **VERIFY** the following light indications:

A. Red Light is ON (2-HS-81-7A). _____

B. Green Light is OFF (2-HS-81-7A). _____

[69] **VERIFY**, locally, PMW Pump 2B is running. _____

[70] **RELEASE** 2-HS-81-7A, PRIMARY WATER PMP B. _____

[71] **VERIFY** the following light indications:

A. Red Light is OFF (2-HS-81-7A). _____

B. Green Light is ON (2-HS-81-7A). _____

[72] **VERIFY**, locally, PMW Pump 2B is STOPPED. _____

[73] **CLOSE** the drain valve to 2-LT-81-1. _____

[74] **RETURN** 2-LT-81-1 to service. _____

[75] **OPEN** 2-RTV-81-201A, PW Pipe Chase/719, ROOT VLV TO LT-81-1. _____

[76] **VERIFY** Window 101-A, PWST LEVEL HI/LO, has CLEARED. _____

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Date _____

6.3 PMW Pumps Logic (continued)

NOTE

The following step will test the PWST Lo Level alarm will be tested. The setpoint for the Lo Level alarm is 16ft

[77] **OPEN** 2-RTV-81-0200A, ROOT VLV TO LG-81-1, until the following. **[ACC CRIT]**

- A. Window 101-A, PWST LEVEL HI/LO, ALARMS _____
- B. Events Display Monitor indicates 101-A PWST LEVEL LO (LS-81-1A) is in "ALARM". _____

[78] **RECORD** PWST level as indicated on 2-LI-81-1A **[ACC CRIT]**

_____ feet _____ inches _____

CAUTION

The setpoint for the high level alarm is 30 feet. 2-LI-81-1A is to be monitored to ensure the tank is **NOT** overflowed. Alarm should occur before a reading of 30 feet 7.5 inches feet on 2-LI-81-1A.

[79] **FILL** the Unit 2 PWST per 0-SOI-81.01 until the following:

- A. Window 101-A, PWST LEVEL HI/LO, ALARMS _____
- B. Events Display Monitor indicates 101-A PWST LEVEL LO (LS-81-1A) is in "ALARM". _____

[80] **RECORD** PWST level as indicated on 2-LI-81-1A **[ACC CRIT]**

_____ feet _____ inches _____

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Date _____

6.3 PMW Pumps Logic (continued)

NOTE

The following step will test the PWST High Level Alarm clears.

- [81] **OPEN** 2-RTV-81-0200A, ROOT VLV TO LG-81-1, until the following
 - A. Window 101-A, PWST LEVEL HI/LO, CLEARS _____
 - B. Events Display Monitor indicates 101-A PWST LEVEL HI (LS-81-1E) is in "NORMAL". _____
 - [82] **CLOSE** 2-RTV-81-0200A, ROOT VLV TO LG-81-1. _____
 - [83] **RECORD** PWST level as indicated on 2-LI-81-1A [**ACC CRIT**]

_____ feet _____ inches _____
 - [84] **REMOVE** ultrasonic flow meter. _____
- CV

6.4 Flowpath Verification

- [1] **ENSURE** prerequisites listed in Section 4.0 for Subsection 6.4 have been completed. _____
- [2] **ENSURE** 2-HS-81-3A [2-M-5], PRIMARY WATER PMP A, is in the IN-MANUAL (NORMAL AFTER STOP) position. _____
- [3] **ENSURE** 2-HS-81-7A [2-M-5], PRIMARY WATER PMP B, is in the IN-MANUAL (NORMAL AFTER STOP) position. _____
- [4] **INSTALL** an ultrasonic flowmeter on the 4 inch pipe near 0-ISV-81-519, Primary Water Pump Discharge X-tie Isolation. _____
- [5] **INSTALL** an ultrasonic flowmeter on the 3 inch pipe downstream of 2-FCV-68-303, RCS FLOW CNTL VLV PRIMARY WATER TO PRT. _____

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Date _____

6.4 Flowpath Verification (continued)

- [6] **OPEN** 0-ISV-81-519, PRIMARY WATER PUMP DISCHARGE XTIE ISOL. _____
- [7] **OPEN** 2-FCV-81-12, PW RCS PRESS RELF TNK & RCP STANDPIPES. _____
- [8] **OPEN** 2-FCV-68-303. _____
- [9] **VERIFY** flow past 2-FCV-68-303 and record in flow verification checklist (Appendix G). _____
- [10] **RECORD** flow rate on Ultrasonic Flow Meter installed near 0-ISV-81-519.**[ACC CRIT]**

_____ GPM _____
- [11] **CLOSE** 2-FCV-68-303. _____
- [12] **PLACE** 2-HS-81-7A, PRIMARY WATER PMP B to the START position. _____

CAUTION

The following step will disable the Unit 1 Primary Water Pump. Since the 2B Primary Water Pump will be used to maintain header pressure ensure the Acceptance criteria in 5.0[1]B has been met.

- [13] **CLOSE** 1-ISV-81-508, PRIMARY WATER RECIRC ISOL. _____
- [14] **ENSURE** both Primary Makeup Water Pumps are removed from service.

NOMENCLATURE	LOCATION	POSITION	UNID	PERF INITIAL
PRIMARY WATER PMP A	1-M-5	STOP	1-HS-81-3A	
PRIMARY WATER PMP B	1-M-5	STOP	1-HS-81-7A	

- [15] **OPEN** 0-ISV-81-515, SPARE. _____
- [16] **RECORD** flow rate on Ultrasonic Flow Meter installed near 0-ISV-81-519.**[ACC CRIT]**

_____ GPM _____

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Date _____

6.4 Flowpath Verification (continued)

- [17] **CLOSE** 0-ISV-81-515, SPARE. _____
- [18] **THROTTLE OPEN** 1-FCV-81-508, PRIMARY WATER RECIRC ISOL. _____
- [19] **STARTUP** Unit 1 Primary Water System per SOI-81.01. _____
- [20] **CLOSE** 0-ISV-81-519. _____
- [21] **PLACE** 2-HS-81-3A, PRIMARY WATER PMP A, is in the PULL P AUTO position. _____
- [22] **OPEN** 2-FCV-68-303. _____
- [23] **VERIFY** locally PMW Pump 2A did **NOT** START. _____
- [24] **CLOSE** 2-FCV-68-303. _____
- [25] **PLACE** 2-HS-81-7A, PRIMARY WATER PMP B to the STOP position. _____
- [26] **PLACE** 2-HS-81-3A, PRIMARY WATER PMP A to the START position. _____
- [27] **PLACE** 2-HS-81-7A, PRIMARY WATER PMP B, is in the PULL P AUTO position. _____
- [28] **OPEN** 2-FCV-68-303. _____
- [29] **VERIFY** locally PMW Pump 2B did **NOT** START. _____
- [30] **CLOSE** 2-FCV-68-303. _____

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Date _____

6.4 Flowpath Verification (continued)

NOTES	
1)	Flow verification lineups will be dependent on Plant configuration at the time of performance. Coordinate with U2 Operations the flow paths verification sequence.
2)	Visual or Ultrasonic verification maybe performed at discretion of the test director.
3)	If verifying flow with an Ultrasonic flow meter, Install flowmeter downstream of valve listed in Appendix G.
4)	When opening valves in Appendix G VERIFY locally PMW Pump in the PULL P AUTO position does not start.

[31] **PERFORM** Flow Verification by opening and closing valves as required for the flow paths per Appendix G. **[ACC CRIT]** _____

[32] **DOCUMENT** flowpath on a copy of 2-47W819-1, Flow Diagram, Primary Water, and attach to test results. _____

[33] **PLACE** 2-HS-81-3A, PRIMARY WATER PMP A to the STOP position. _____

[34] **REMOVE** ultrasonic flow meters. _____

CV

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Data Package: Page ____ of ____

Date _____

7.0 POST-PERFORMANCE ACTIVITIES

- [1] **ENSURE** that Post-test calibration of the M&TE used to record quantitative acceptance criteria has been satisfactorily performed and the results recorded on Measuring and Test Equipment (M&TE) Log, Appendix F in SMP-9.0 _____
- [2] **ENSURE** that Post-test calibration of permanent plant instruments used to record quantitative acceptance criteria has been satisfactorily performed and the results recorded on Appendix C, Permanent plant Instrumentation Log. _____
- [3] **REMOVE** the jumper installed across terminals TB-610-9 and TB-610-10 in Panel 2-R-48. _____

 IV
- [4] **REMOVE** that Plastic screws and washers at the Vendor Terminals TB-610-9 and TB-610-10 in Panel 2-R-48 are installed. _____

 IV
- [5] **ENSURE** blank off plate on Stand Pipe connection from Seal 3 leak off on RCP's 1-4 is removed. _____

 IV
- [6] **ENSURE** Stand Pipe connection from Seal 3 leak off on RCP's 1-4 is reinstalled. _____

 IV
- [7] **REMOVE** temporary hose downstream of valves 2-RTV-81-0200A, ROOT VLV TO LG-81-1. _____

 IV
- [8] **REMOVE** a temporary hose downstream of valve 0-ISV-81-515, SPARE. _____

 IV
- [9] **RETURN** valves in Appendix F to As Found position. _____

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Date _____

7.0 POST-PERFORMANCE ACTIVITIES (continued)

[10] **NOTIFY** the Unit 1 US/SRO or SM of the test completion and system alignment. _____

[11] **NOTIFY** the Unit 2 US/SRO or SM of the test completion and system alignment. _____

8.0 RECORDS

A. QA Records

Completed Test Package

B. Non-QA Records

None

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**Appendix A
(Page 1 of 1)**

TEST PROCEDURES/INSTRUCTIONS REFERENCE REVIEW

Data Package: Page ____ of ____

Date _____

NOTES
<p>1) Additional copies of this table may be made as necessary.</p> <p>2) Initial and date indicates review has been completed for impact.</p>

PROCEDURE/ INSTRUCTION	REVISION/ CHANGES	IMPACT Yes/No	INITIAL AND DATE. (N/A for no change)
FSAR Table 6.2.4-1, Sht 26			
FSAR Table 14.2-1, Sht 6			
2-TSD-81			
WBN2-81-4001			
N3-81-4001			
WB-DC-40.31.16			
SSD-2-LPL-81-1 (Review against SSD-1-LPL-81-1)			
SSD-2-PI-81-2 (Review against SSD-1-PI-81-2)			
SSD-2-PI-81-4 (Review against SSD-1-PI-81-4)			
SSD-2-PI-81-6 (Review against SSD-1-PI-81-6)			
SSD-2-PI-81-8 (Review against SSD-1-PI-81-8)			

Test Engineer Signature

Date

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**Appendix C
(Page 1 of 1)**

PERMANENT PLANT INSTRUMENTATION LOG

Data Package: Page ____ of ____

Date _____

INSTRUMENT OR INSTRUMENT LOOP #	CAL DUE DATE	ACCURACY	FILLED * AND VENTED	PLACED IN SERVICE *	USED FOR QUANTITATIVE ACC CRIT		POST-TEST CAL DATE**	POST-TEST CALIBRATION ACCEPTABLE INITIAL/DATE
			INIT/ DATE	INIT/DATE	YES	NO		
2-PI-81-2		±0.5 psig						
2-PI-81-4		±2.0 psig						
2-PI-81-6		±0.5 psig						
2-PI-81-8		±2.0 psig						
2-PCV-81-10		N/A						
2-PDIS-81-5A		±2.75ft WC						
2-PDIS-81-5B		±2.75ft WC						
2-PDIS-81-9A		±2.75ft WC						
2-PDIS-81-9B		±2.75ft WC						
2-LPL-81-1		N/A						

* These items may be initialed and dated by personnel performing the task.

** May be identified as **NOT** Applicable (NA) if instrument was **NOT** used to verify/record quantitative acceptance criteria data.

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**Appendix D
(Page 1 of 1)**

BREAKER/ FUSE LINEUP

Data Package: Page ____ of ____

Date _____

BREAKER IDENTIFICATION	BREAKER NOMENCLATURE	POSITION	INITIAL/DATE	CV
WBN-0-BKR-236-0003/310-F	PANEL 4 COLUMN A FUSE ASSEMBLY	ON		
WBN-0-FU-236-0003/A20-A	PRIMARY MAKEUP WATER RCS PRESS RELIEF TANK & RCP STANDPIPES ISOLATION VALVE TRAIN A	INSTALLED		
WBN-0-BKR-236-0003/311-F	PANEL 4 COLUMN B FUSE ASSEMBLY	ON		
WBN-0-FU-236-0003/B20-A	PRIMARY MAKEUP WATER RCS PRESS RELIEF TANK & RCP STANDPIPES ISOLATION VALVE TRAIN A	INSTALLED		
WBN-0-BKR-236-0003/217-F	PANEL 4 COLUMN D FUSE ASSEMBLY	ON		
WBN-0-FU-236-0003/D33	RCP 1 STANDPIPE MAKEUP WATER VLV	INSTALLED		
WBN-0-BKR-236-0003/218-F	PANEL 4 COLUMN E FUSE ASSEMBLY	ON		
WBN-0-FU-236-0003/E34	RCP 3 STANDPIPE MAKEUP WATER VLV	INSTALLED		
WBN-0-BKR-236-0004/217-G	PANEL 4 COLUMN D FUSE ASSEMBLY	ON		
WBN-0-FU-236-0004/D34	RCP 2 STANDPIPE MAKEUP WATER VLV	INSTALLED		
WBN-0-FU-236-0004/D35	RCP 4 STANDPIPE MAKEUP WATER VLV	INSTALLED		

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**Appendix E
(Page 1 of 1)**

HANDSWITCH LINEUP

Data Package: Page ____ of ____

Date _____

SWITCH NUMBER	SWITCH LOCATION	NOMENCLATURE	POSITION	INITIAL/DATE
2-HS-77-415	0-L-2	RCDT DRAIN CONTROL VALVE	AUTO	
2-HS-81-12C	2-L-10	PW TO RCP STANDPIPES	CLOSED	
2-HS-81-12A	2-M-5	PRIMARY WATER TO PRT & STANDPIPES	CLOSED	
2-HS-81-3A	2-M-5	PW MAKEUP PUMP A CONT	CLOSED	
2-HS-81-7A	2-M-5	PRIMARY WATER PMP B	CLOSED	
2-HS-81-13	2-M-5	PW TO RCP 1 STANDPIPE	CLOSED	
2-HS-81-14	2-M-5	PW TO RCP 2 STANDPIPE	CLOSED	
2-HS-81-15	2-M-5	PW TO RCP 3 STANDPIPE	CLOSED	
2-HS-81-16	2-M-5	PW TO RCP 4 STANDPIPE	CLOSED	

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**Appendix F
(Page 1 of 22)**

VALVE LINEUP

Data Package: Page ____ of ____

Date _____

VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING EL 692							
2-SMV-43-802	PMWS PUMP 2A DISCH SAMPLE ISOL	(A13U/692)		CLOSED			
2-SMV-43-803	PMWS PUMP 2B DISCH SAMPLE ISOL	(A13U/692)		CLOSED			
0-ISV-77-695	SPENT RESIN STORAGE TNKPW SUPPLY ISOL	(A11X/692)		CLOSED			
0-ISV-081-11	ISOLATION VLV PRIMARY WATER	AB/692		CLOSED			
0-ISV-81-19	ISOLATION VLV PRIMARY WATER SUPPLY TO RADWASTE	AB/692/ABOVE U2 PRI WTR PMPS		CLOSED			
0-ISV-81-514	WASTE DISPOSAL PW SUPPLY HEADER ISOL	(A8T/692)		OPEN			
0-ISV-81-515	SPARE	(A8X/692)		CLOSED			

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**Appendix F
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VALVE LINEUP**

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Date _____

VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING EL 692							
0-ISV-81-516	PRIMARY WATER SPARE	(A9X/692)		CLOSED			
0-ISV-81-517	PRIMARY WATER SPARE	(A10W/692)		CLOSED			
0-ISV-81-519	PRIMARY WATER PUMP DISCHARGE XTIE ISOL	(A10T/692)		CLOSED			
0-ISV-81-520	WASTE DISPOSAL PW SUPPLY HEADER ISOL	(A14W/692)		OPEN			
0-ISV-81-546	EVAP CNDS DEMINERALIZERPW SUPPLY ISOL	(A6R/713)		CLOSED			
1-ISV-81-522A	BA EVAPORATOR FLUSH PW SUPPLY ISOL	(A2S/692)		CLOSED			
1-ISV-81-522B	BA EVAP ABSORPTION TWR PW FLUSH	(A2S/692)		CLOSED			

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Date _____

VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING EL 692							
1-ISV-81-522C	BA EVAP CONDENSER FLUSHPW SUPPLY ISOL	(A2S/692)		CLOSED			
1-ISV-81-522D	BA EVAP VENT COND FLUSHPW SUPPLY ISOL	(A4S/692)		CLOSED			
1-ISV-81-522E	BA EVAP FEED PREHEATER FLUSH PW SUPPLY ISOL	(A2S/692)		CLOSED			
1-ISV-81-522F	BA EVAP CONC PUMP 1 PW FLUSH	(A3S/692)		CLOSED			
1-ISV-81-522G	BA EVAP CONC PUMP 2 PW FLUSH	(A3S/692)		CLOSED			
1-ISV-81-535	PDP SEAL WATER RSVR PW SUPPLY ISOL	(A6S/692)		CLOSED			

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VALVE LINEUP**

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VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING EL 692							
1-DRV-81-536	BORIC ACID EVAPORATION PW HEADER DRAIN	(A2S/692)		CLOSED			
2-ISV-77-574	MONITOR TANK PUMP TO PW PUMP SUCTION ISOL	(A13U/692)		CLOSED			
2-RTV-81-202A	ROOT V TO PI-81-2	(A14T/692)		OPEN			
2-RTV-81-203A	ROOT V TO PI-81-6	(A14T/692)		OPEN			
2-RTV-81-204A	ROOT V TO PI-81-4	(A14T/692)		OPEN			
2-RTV-81-205A	ROOT V TO PI-81-8	(A14T/692)		OPEN			
2-RTV-81-206A	2-PDIS-81-5A/ 2-PDIS-81-5B ROOT	(A14T/692)		OPEN			
2-RTV-81-207A	2-PDIS-81-9A/ 2-PDIS-81-9B ROOT	(A14T/692)		OPEN			

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VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING EL 692							
2-ISV-81-503	HDR ISOLATION	(A13T/692)		OPEN			
2-ISV-81-505A	PWMS PUMP 2A SUCTION ISOLATION	(A14T/692)		OPEN			
2-ISV-81-505B	PWMS PUMP 2B SUCTION ISOLATION	(A14T/692)		OPEN			
2-ISV-81-507A	PRIMARY WATER PUMP 2A DISCHARGE ISOL	(A14T/692)		OPEN			
2-ISV-81-507B	PRIMARY WATER PUMP 2B DISCHARGE ISOL	(A14T/692)		OPEN			
2-ISV-81-508	PMWS PMP RECIRC SOV	(A15T/692)		OPEN			
2-BYV-81-510	PWMS PUMPS 2A/2B RECIRC ISOLATION	(A15T/692)		OPEN			

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VALVE LINEUP

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Date _____

VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING EL 692							
2-ISV-81-522A	BA EVAP CONDENSER FLUSH PW SUPPLY ISOL	(A13S/692)		CLOSED			
2-ISV-81-522B	BA EVAPORATOR FLUSH PW SUPPLY ISOL	(A13S/692)		CLOSED			
2-ISV-81-522C	BA EVAP CONC PUMP 1 PW FLUSH	(A13S/692)		CLOSED			
2-ISV-81-522D	BA EVAP CONC PUMP 2 PW FLUSH	(A13S/692)		CLOSED			
2-ISV-81-522E	BA EVAP ABSORPTION TWR PW FLUSH	(A13S/692)		CLOSED			
2-ISV-81-522F	BA EVAP FEED PREHEATER FLUSH PW SUPPLY ISOL	(A13S/692)		CLOSED			

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VALVE LINEUP

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VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING EL 692							
2-ISV-81-522G	BA EVAP VENT COND FLUSHPW SUPPLY ISOL	(A13S/692)		CLOSED			
2-ISV-81-535	PDP SEAL WTR RSVR PW SUPPLY ISOL	(A11T/692)		CLOSED			
2-DRV-81-536	BORIC ACID EVAPORATION PW HEADER DRAIN	(A14S/692)		CLOSED			
2-DRV-81-537	PRI WTR MAKEUP PUMP 2A CASING DR	(A14T/692)		CLOSED			
2-DRV-81-538	PRI WTR MAKEUP PUMP 2B CASING DR	(A14T/692)		CLOSED			
2-BYV-81-555	PRIMARY WATER RECIRC CONTROL BYPASS	(C13P/708)		OPEN			

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VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING EL 704							
2-ISV-32-3177	ISOLATION VALVE TO 2-FCV-81-12 CLOSED FOR ABSCE BOUNDARY FOR DCN 52283	(A14U/704)		OPEN			

VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING EL 713							
0-ISV-62-1042	BORIC ACID BATCH TANK PRI WTR SUPPLY	(A13R/713)		CLOSED			
0-ISV-77-587	WASTE EVAP CNDS DEMIN PW BACKWASH	(A11Q/713)		CLOSED			
0-ISV-78-522	SFP PRIMARY WATER SUP ISOL	(A8R/713)		CLOSED			

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VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING EL 713							
0-ISV-81-521	WASTE DISPOSAL PW SUPPLY HEADER ISOL	(A14R/713)		OPEN			
0-ISV-81-527	CAUSTIC BATCH TANK PW SUPPLY ISOL	(A6Q/713)		CLOSED			
0-ISV-81-531	WASTE GAS COMPRESSOR A PW SUPPLY ISOL	(A4R/713)		CLOSED			
0-ISV-81-532	WASTE GAS COMPRESSOR B PW SUPPLY ISOL	(A4R/713)		CLOSED			
1-FLV-62-1051A	BA XFER PUMP 1A-A FLUSH	(A12R/713)		CLOSED			
1-FLV-62-1051B	BA XFER PUMP 1B-B FLUSH	(A12R/713)		CLOSED			
1-FLV-62-986A	CVCS EVAP FEED ION EXCH 1A BACKWASH	(A10R/713)		CLOSED			

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VALVE LINEUP**

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Date _____

VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING EL 713							
1-FLV-62-986B	CVCS EVAP FEED ION EXCH 1B BACKWASH	(A10R/713)		CLOSED			
1-ISV-81-540	CATION AND MIXED BED DEMINERALIZER PW SUPPLY	(A4U/713)		CLOSED			
2-BYV-59-657	PW MAKEUP HEADER FLOW TOTALIZER BYPASS	(A14V/713)		CLOSED			
2-ISV-59-658	FQ-59-182 ISOLATION	(A14V/713)		CLOSED			
2-ISV-62-1021	COND FILTER OUTLET	(A10S/713)		CLOSED			
2-FLV-62-1051A	BA XFER PUMP 2A-A FLUSH	(A13R/713)		CLOSED			
2-FLV-62-1051B	BA XFER PUMP 2B-B FLUSH	(A123/713)		CLOSED			
2-FLV-62-923	CVCS SPENT RESIN HDR PRI WTR FLUSH	(A12U/713)		CLOSED			

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VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING EL 713							
2-ISV-62-933	BA BLEND PW SUPPLY	(A12V/713)		CLOSED			
2-FLV-62-986A	CVCS EVAP FEED ION EXCH 2A BACKWASH	(A8R/713)		CLOSED			
2-FLV-62-986B	PMWS TO EVAPORATOR FEED ION EXCHANGER 2B	(A10R/713)		CLOSED			
2-FCV-81-12	PW RCS PRESS RELF TNK & RCP STANDPIPES	(A12W/713)		CLOSED			
2-ISV-81-504	CATION/MIXED BED DEMIN PW FLUSH	(A13U/713)		CLOSED			
2-TV-81-529	TEST CONNCLOSED FOR ABSCE BOUNDARY FOR DCN 52283	(A12W/713)		CLOSED			
2-TV-81-530	TEST CONN	(A12W/713)		CLOSED			

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VALVE LINEUP**

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VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING EL 713							
2-ISV-81-533	HEADER ISOLATION VALVE	(A12W/713)		OPEN			

VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING PIPE TUNNEL EL 726							
2-SMV-81-201B	ISOL VLV TO SINK NO. 12	(P TUNN)		CLOSED			

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VALVE LINEUP**

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VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING EL 729							
0-ISV-81-512	MOBILE DEMIN FILTRATION ISOL	(A5Y/729)		CLOSED			
0-ISV-81-518	TRITIATED WATER REMOVAL PW CONN ISOL	(A8X/729)		CLOSED			
0-VTV-81-545	PRIMARY WATER HEADER VENT	(A8X/729)		CLOSED			
0-VTV-81-547	PRIMARY WATER HEADER VENT	(A8X/729)		CLOSED			
0-ISV-81-548	CDWE WASH PRIMARY WATERSUPPLY ISOL	(A8Y/729)		CLOSED			
0-ISV-81-549	FUTURE WASH RACK PW SUPPLY ISOL	(A8Y/729)		CLOSED			

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VALVE LINEUP**

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Date _____

VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING EL 729							
0-VTV-81-553	RAILROAD BAY PW SUPPLY VENT	(A4W/729)		CLOSED			

VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING EL 737							
0-ISV-81-513	RESIN FILL TANK PW SUPPLY ISOL	(A4U/737)		CLOSED			
0-ISV-81-523	RESIN FILL TANK PW SUPPLY ISOL	(A9Q/737)		CLOSED			
0-ISV-81-524	RESIN FILL TANK PW SUPPLY ISOL	(A12U/737)		CLOSED			

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VALVE LINEUP**

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VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING EL 737							
0-VTV-81-541	RESIN FILL TANK PW SUPPLY HEADER VENT	(A12R/737)		CLOSED			
0-VTV-81-542	RESIN FILL TANK PW SUPPLY HEADER VENT	(A13Q/737)		CLOSED			
0-VTV-81-543	RESIN FILL TANK PW SUPPLY HEADER VENT	(A13T/737)		CLOSED			
0-VTV-81-544	RESIN FILL TANK PW SUPPLY HEADER VENT	(A3U/737)		CLOSED			

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VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
AUXILIARY BUILDING EL 743							
0-ISV-81-550	CDWE WASH PRIMARY WATERSUPPLY ISOL	(A1K/743)		CLOSED			

VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
CONTAINMENT BUILDING EL 702							
2-THV-62-621	RCP 2 STANDPIPE PRI WTR FLOW BAL	(RB2/702)		OPEN			
2-FCV-68-303	RCS FLOW CNTL VLV PRIMARY WATER TO PRT	(RB2/702)		CLOSED			
2-FCV-68-310	RCS FLOW CNTL PRT TO WDS RCDT	(RB2/702)		CLOSED			

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2-VTV-68-4	VACUUM REFILL CONN	(RB2/702)		CLOSED			
2-RTV-68-451A	RT VLV TO PT-68-301	(RB2/702)		CLOSED			
2-RTV-68-452A	2-LT-68-300 ROOT	(RB2/702)		CLOSED			
2-VTV-68-573	PRESSURIZER RELIEF TANK VENT	(RB2/702)		CLOSED			
2-ISV-68-574	PRESSURIZER RELIEF TANKGAS ANALYZER SUP ISOL	(RB2/702)		CLOSED			
2-FCV-77-3	RCDT DRAIN VLV FLOW CONTROL	(RB2/702)		CLOSED			
2-ISV-77-514A	RCD PUMP A SUCT SO	(RB2/702)		CLOSED			
2-ISV-77-514B	RCD PUMP A SUCT SO	(RB2/702)		CLOSED			

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VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
CONTAINMENT BUILDING EL 718							
2-DRV-81-539	PRIMARY WATER HDR DRAIN	(RB2/718)		CLOSED			

VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
CONTAINMENT BUILDING EL 720							
2-THV-62-620	RCP 1 STANDPIPE PRI WTR FLOW BAL	(RB2/720)		OPEN			
2-THV-62-623	RCP 4 STANDPIPE PRI WTR FLOW BAL	(RB2/720)		OPEN			

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VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
CONTAINMENT BUILDING EL 720							
2-DRV-62-632	RCP 1 STANDPIPE DRAIN	(RB2/720)		OPEN			
2-DRV-62-633	RCP 2 STANDPIPE DRAIN	(RB2/720)		OPEN			
2-DRV-62-634	RCP 3 STANDPIPE DRAIN	(RB2/720)		OPEN			
2-DRV-62-635	RCP 3 STANDPIPE DRAIN	(RB2/720)		OPEN			

VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
CONTAINMENT BUILDING EL 723							
2-ISV-32-3535	CONTROL AIR ISOLATION VALVE TO 2-FCV-81-16	(RB2-AZ315/723)		OPEN			

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VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
CONTAINMENT BUILDING EL 723							
2-ISV-32-3598	CONTROL AIR ISOLATION VALVE TO 2-FCV-81-15	(RB2-AZ224/723)		OPEN			
2-ISV-32-3630	CONTROL AIR ISOLATION VALVE TO 2-FCV-81-13	(RB2-AZ46/723)		OPEN			
2-ISV-32-3651	CONTROL AIR ISOLATION VALVE TO 2-FCV-81-14	(RB2-AZ135/723)		OPEN			
2-FCV-81-13	RCP NO 1 STANDPIPE MAKEUP WATER	(RB2-AZ46/723)		CLOSED			
2-FCV-81-14	RCP NO 2 STANDPIPE MAKEUP WATER	(RB2-AZ135/723)		CLOSED			
2-FCV-81-15	RCP NO 3 STANDPIPE MAKEUP WATER	(RB2-AZ224/723)		CLOSED			

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VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
CONTAINMENT BUILDING EL 723							
2-FCV-81-16	RCP NO 4 STANDPIPE MAKEUP WATER	(RB2-AZ315/723)		CLOSED			
2-ISV-81-501	CNTM ISOLATION BLOCK VALVE	(CLA#4AZ301/723)		OPEN			
2-TV-81-528	PRIMARY WATER CNTMT HDR TEST CONN	(CLA#4AZ301/723)		CLOSED			
2-DRV-81-534	DRAIN VALVE	(CLA#4AZ301/723)		CLOSED			

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VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
CONTAINMENT BUILDING EL 729							
2-THV-62-622	RCP 3 STANDPIPE PRI WTR FLOW BAL	(RB/729)		OPEN			

VALVE NUMBER	NOMENCLATURE	LOCATION COL/EL	AS-FOUND POSITION	REQUIRED POSITION	INITIAL/ DATE	RETURN TO AS-FOUND INITIAL/ DATE	RETURN IV INITIAL/ DATE
YARD EL 729							
2-RTV-81-200A	ROOT VLV TO LG-81-1	(YD@PWST/729)		CLOSED			
2-RTV-81-201A	2-LT-81-1 ROOT	PWST		OPEN			
2-ISV-81-549	PWST VACUUM /NITROGEN CHARGING ISOLATION	PWST		CLOSED			

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**Appendix G
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FLOW VERIFICATION CHECKLIST

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VALVE NUMBER (Flow Path)	DESCRIPTION	* FLOW VERIFIED		VERIFIED INITIAL/ DATE	OPEN INITIAL/ DATE	CLOSE INITIAL/ DATE
		¹ VISUAL	² ULTRASONIC			
2-FCV-81-13	RCP NO 1 STANDPIPE MAKEUP WATER		M&TE ID _____			
2-FCV-81-14	RCP NO 2 STANDPIPE MAKEUP WATER		M&TE ID _____			
2-FCV-81-15	RCP NO 3 STANDPIPE MAKEUP WATER		M&TE ID _____			
2-FCV-81-16	RCP NO 4 STANDPIPE MAKEUP WATER		M&TE ID _____			
2-ISV-81-504	ISLN TO CATION & MIXED BED DMNRLZRS		M&TE ID _____			
2-FCV-68-303	PW TO PRT		M&TE ID _____			
2-BYIV-81-201B	BYPASS ISOL VLV TO LT-81-1		M&TE ID _____			
2-ISV-62-933	BA BLEND PW SUPPLY		M&TE ID _____			

* Flow can be verified with either the use of an ultrasonic flowmeter or visually. **N/A** the flow method **NOT** used.

1 Visual flow is defined as "steady stream" of water.

2 Ultrasonic flow is defined as "Consistent positive flow" of water.

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**Data Sheet 1
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PRIMARY MAKEUP WATER PUMP 2A

Data Package: Page ____ of ____

Date _____

[1]
$$TDH = (P_D - P_S) \text{ LB/IN}^2 \times \frac{144 \text{ IN}^2 / \text{FT}^2}{62.4 \text{ LB/FT}^3}$$

[2] **RECORD** the following data:

A. Step 6.3[28] required flow between 150 and 166 gpm. _____

_____ GPM

B. Step 6.3[29]A _____

_____ psig

Suction

C. Step 6.3[29]B _____

_____ psig

Discharge

[3] **CALCULATE** the following:

$$TDH = \left(\frac{\text{_____}}{\text{Discharge Press}} - \frac{\text{_____}}{\text{Suction Press}} \right) \times 2.31 = \text{_____ ft}$$

Calculations Performed By: _____

Calculations Verified By: _____

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**Data Sheet 2
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PRIMARY MAKEUP WATER PUMP 2B

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Date _____

[4]
$$TDH = (P_D - P_S) \text{ LB/IN}^2 \times \frac{144 \text{ IN}^2 / \text{FT}^2}{62.4 \text{ LB/FT}^3}$$

[5] **RECORD** the following data:

A. Step 6.3[37] required flow between 150 and 166 gpm. _____

_____ GPM

B. Step 6.3[38]A _____

_____ psig

Suction

C. Step 6.3[38]B _____

_____ psig

Discharge

[6] **CALCULATE** the following:

$$TDH = \left(\frac{\text{Discharge Press}}{\text{Suction Press}} \right) \times 2.31 = \text{_____ ft}$$

Calculations Performed By: _____

Calculations Verified By: _____