

SEQUOYAH NUCLEAR PLANT JOB PERFORMANCE MEASURE

B.1.f JPM 115-2AP

Respond To ERCW Pump Trip per AOP-M.01

**PREPARED/
REVISED BY:** _____ Date/ _____

VALIDATED BY: * _____ Date/ _____

APPROVED BY: _____ Date/ _____
(Operations Training Manager)

CONCURRED: ** _____ Date/ _____
(Operations Representative)

* Validation not required for minor enhancements, procedure Rev changes that do not affect the JPM, or individual step changes that do not affect the flow of the JPM.
** Operations Concurrence required for new JPMs and changes that affect the flow of the JPM (if not driven by a procedure revision).

NUCLEAR TRAINING
REVISION/USAGE LOG

[illegible]

V - Specify if the JPM change will require another validation (Y or N).
See cover sheet for criteria.

SEQUOYAH NUCLEAR PLANT
RO/SRO
JOB PERFORMANCE MEASURE

Task:

Respond to ERCW Pump Trip

Note: This JPM satisfies Simulator Manipulation "L".

JA/TA task # : 0000620501 (RO)

K/A Ratings:

076A2.01	(3.5/3.7)	076K4.06	(2.8/3.2)
076A4.01	(2.9/2.9)	076A2.02	(2.7/3.1)
076K6.04	(2.1/2.2)		

Task Standard:

STANDBY A TRAIN ERCW Pump has been started and the auto start selection switch is selected away from Q-A ERCW Pump position. ERCW Header leak has been isolated.

Evaluation Method : Simulator X In-Plant

Performer:

NAME

Start Time

Performance Rating : SAT UNSAT Performance Time

Finish Time

Evaluator:

SIGNATURE

DATE

COMMENTS

SPECIAL INSTRUCTIONS TO EVALUATOR:

1. Critical steps are identified within the step
2. Sequenced steps identified by an "s"
3. Any UNSAT requires comments
4. Initialize the simulator in IC #16. Ensure Q-A ERCW pump is in service and the selector switch is selected for Q-A. Ensure 1B-B CCP is running and 1A-A is in standby.
5. Activate MF #RW01G (Trips Q-A ERCW Pump)
6. Freeze the simulator until the operator has been briefed and is ready to perform task.
7. **Console operator must insert malfunction RW13B at 90% prior to JPM step 8.**
8. **See specific JPM steps for required remote function manipulations.**
9. Ensure operator performs the following required actions for **SELF-CHECKING**;
 - a. Identifies the correct unit, train, component, etc.
 - b. Reviews the intended action and expected response.
 - c. Compares the actual response to the expected response.

Validation Time: CR. 30 mins Local _____

Tools/Equipment/Procedures Needed:

AOP-M.01, Section 2 and 2.1, 2.10

References:

	Reference	Title	Rev No.
A.	AOP-M.01	Loss of ERCW	15

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READ TO OPERATOR

Directions to Trainee:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM. I will provide initiating cues and reports on other actions when directed by you. When you complete the task successfully, the objective for this job performance measure will be satisfied. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the handout sheet I provided you.

INITIAL CONDITIONS:

Unit is in mode 1 at 100% power

INITIATING CUES:

You are the CRO and are to monitor the board and respond, as a reader/doer, to any event that may occur.

Inform SM when any required action(s) associated with the failure have been completed.

Job Performance Checklist:

STEP/STANDARD	SAT/UNSAT
<p><u>Examiner NOTE:</u> Candidate may perform the ARP actions. They are identical to procedure steps.</p> <p><u>STEP 1.:</u> Obtain a copy of the appropriate procedure.</p> <p><u>Cue:</u> <i>The SM will evaluate Tech Specs, TRM, and the REP</i></p> <p><u>STANDARD:</u> A copy of the AOP-M.01 has been obtained and goes to section 2.1.</p> <p><u>COMMENTS:</u></p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Start Time___</p>
<p><u>STEP 2.:</u> [1] IDENTIFY and LOCK OUT failed ERCW pump</p> <p><u>STANDARD:</u> ERCW pump Q-A HAND SWITCH has been placed in the PULL TO LOCK position.</p> <p><u>COMMENTS:</u></p>	<p>___ SAT</p> <p>___ UNSAT</p>
<p><u>STEP 3.:</u> [2] START additional ERCW pumps as required to maintain header pressure between 78 psig and 124 psig.</p> <p><u>STANDARD:</u> Operator starts another A (J-A) Train ERCW pump. This step is critical to return header pressure to normal.</p> <p><u>COMMENTS:</u></p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Critical Step</p>
<p><u>STEP 4.:</u> [3] CHECK two A Train ERCW Pumps AVAILABLE.</p> <p><u>STANDARD:</u> Operator verifies at least 2 A train ERCW pumps available</p> <p><u>COMMENTS:</u></p>	<p>___ SAT</p> <p>___ UNSAT</p>

Job Performance Checklist:

STEP/STANDARD	SAT/UNSAT
<p>STEP 5.: [4] CHECK 1A and 2A ERCW supply header pressures and flows NORMAL: a. Supply Header pressures [between 78 psig and 124 psig]: • 1-PI-67-493A • 2-PI-67-493A</p> <p>STANDARD: Operator checks header pressures are between 78 and 124 psig on both A Train indicators.</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p>
<p>STEP 6.: b. Supply Header flows [expected value]. • 1-FI-67-61 • 2-FI-67-61</p> <p>STANDARD: Operator checks there is flow on the A train supply header as indicated on both indicators.</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p>
<p>Console operator insert malfunction RW13B at 90% prior to checking header flows.</p>	
<p>STEP 7.: [5] CHECK 1B and 2B ERCW supply header pressures and flows NORMAL: a. Supply Header pressures [between 78 psig and 124 psig]: • 1-PI-67-488A • 2-PI-67-488A b. Supply header flows [expected value]: • 1-FI-67-62 • 2-FI-67-62</p> <p>Cue: <i>If asked, ERCW pipe break has occurred.</i></p> <p>STANDARD: Operator checks header pressures are between 78 and 124 psig on both B Train indicators. Flows are abnormal, transitions to section 2.10.</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p>

Job Performance Checklist:

STEP/STANDARD	SAT/UNSAT
EVALUATOR NOTE: The following steps are from section 2.10:	
<p>STEP 8: [1] Stop and LOCK OUT All Train B ERCW Pumps</p> <p>Cue: <i>If asked, leak rate has slowed.</i></p> <p>STANDARD: Operator places all running B train ERCW pumps in pull-to-lock position. This step is critical to prevent pumping water out the break.</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Critical Step</p>
<p>STEP 9: [2] DISPATCH operators with radios to perform the following:</p> <ul style="list-style-type: none"> • PERFORM Appendix F, ERCW Rx MOV Board ERCW Valves. • PERFORM Appendix G, ERCW MCC Valves. • ENSURE all pumping station watertight doors are CLOSED. <p>Cue: <i>Play role of AUO and acknowledge the request.</i></p> <p>STANDARD: Operator dispatches operators to perform the required appendices and actions. This step is critical to supply power to valves needed to isolate the leak.</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Critical Step</p>
<p>STEP 10: [3] ENSURE 1A and 2A CCPs RUNNING.</p> <p>Cue: <i>Play role of U2 CRO and start 2A CCP</i></p> <p>STANDARD: Operator starts 1A-A charging pump. This step is critical to supply RCP seals and normal charging from A train equipment.</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Critical Step</p>

Job Performance Checklist:

STEP/STANDARD	SAT/UNSAT
EVALUATOR NOTE: The following steps are from section 2.10:	
<p>STEP 8.: [1] Stop and LOCK OUT All Train B ERCW Pumps</p> <p>Cue: <i>If asked, leak rate has slowed.</i></p> <p>STANDARD: Operator places all running B train ERCW pumps in pull-to-lock position. This step is critical to prevent pumping water out the break.</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Critical Step</p>
<p>STEP 9.: [2] DISPATCH operators with radios to perform the following:</p> <ul style="list-style-type: none"> • PERFORM Appendix F, ERCW Rx MOV Board ERCW Valves. • PERFORM Appendix G, ERCW MCC Valves. • ENSURE all pumping station watertight doors are CLOSED. <p>Cue: <i>Play role of AUO and acknowledge the request.</i></p> <p>STANDARD: Operator dispatches operators to perform the required appendices and actions. This step is critical to supply power to valves needed to isolate the leak.</p> <p>NOTE: Once Appendix G is complete, state that the leak is stopped.</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Critical Step</p> <p><i>Leak not stopped until 1:45 pm</i></p> <p><i>Complete</i></p>
<p>STEP 10.: [3] ENSURE 1A and 2A CCPs RUNNING.</p> <p>Cue: <i>Play role of U2 CRO and start 2A CCP</i></p> <p>STANDARD: Operator starts 1A-A charging pump. This step is critical to supply RCP seals and normal charging from A train equipment.</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Critical Step</p>

Job Performance Checklist:

STEP/STANDARD	SAT/UNSAT
<p>STEP 11.: [4] STOP and LOCK OUT effected equipment:</p> <p>a. PLACE the following pumps in PULL TO LOCK:</p> <ul style="list-style-type: none"> ▪ 1B CCP ▪ 2B CCP ▪ 1B SI Pump ▪ 2B SI Pump <p>Cue: <i>Play role of U2 CRO and Stop/Lockout associated pumps</i></p> <p>STANDARD: Operator secures the running pumps in the control room and dispatches an AUO to lockout the B Aux Control Air Compressor. This step is critical to prevent start of ECCS equipment without cooling water available to the room coolers.</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Critical Step</p>
<p>STEP 12.: b. DISPATCH operator to place Train B Aux Air Compressor in SAFE STOP.</p> <p>Cue: <i>Play role of AUO and acknowledge the request.</i></p> <p>STANDARD: Operator secures the running pumps in the control room and dispatches an AUO to lockout the B Aux Control Air Compressor</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p>
<p>STEP 13.: [5] OPEN alternate ERCW supply to B train DGs:</p> <ul style="list-style-type: none"> • 1-FCV-67-65 (1B DG) • 2-FCV-67-65 (2B DG) <p>Cue: <i>Play role of U2 CRO/AUO and acknowledge the request.</i></p> <p>STANDARD: Operator opens 1-FCV-67-65 and directs opening of 2-FCV-67-65.</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Critical Step</p>

Job Performance Checklist:

STEP/STANDARD	SAT/UNSAT
<p>EVALUATOR NOTE: RCP Temperature alarms may come in depending on pace.</p> <p>STEP 14.: [6] ISOLATE B Train ERCW Header rupture:</p> <ul style="list-style-type: none"> a. CLOSE 1-FCV-67-489, Header 1B Isol Before Strainer [ERCW MCC 1BB Compt. 3C]. b. CLOSE 2-FCV-67-489, Header 2B Isol Before Strainer [ERCW MCC 2BB Compt. 3C]. <p>Cue: <i>Play role of AUO and acknowledge the request.</i></p> <p>STANDARD: Operator notifies an AUO to close the valves to isolate the B ERCW header. This step is critical to isolate the ERCW leak.</p> <p>COMMENTS:</p> <p>Console Operator perform the following to isolate the leak:</p> <p>MRF RWRV489 0% MRF RWR2V489 0%</p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Critical Step</p>
<p>STEP 15.: [7] OPERATE available A Train ERCW Pumps to maintain pressure between 78 psig and 124 psig.</p> <p>STANDARD: Operator will start an additional A train pump. This step is critical to return ERCW supply header pressure to normal.</p> <p>COMMENTS:</p> <p>Pressure is less than 78 psig, but procedure also allows reducing flow to non-essential equipment to raise pressure.</p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Critical Step</p>

Job Performance Checklist:

STEP/STANDARD	SAT/UNSAT
<p>EVALUATOR NOTE: RCP Temperature alarms may come in depending on pace.</p> <p>STEP 14: [6] ISOLATE B Train ERCW Header rupture:</p> <p>a. CLOSE 1-FCV-67-489, Header 1B Isol Before Strainer [ERCW MCC 1BB Compt. 3C].</p> <p>b. CLOSE 2-FCV-67-489, Header 2B Isol Before Strainer [ERCW MCC 2BB Compt. 3C].</p> <p>Cue: <i>Play role of AUO and acknowledge the request.</i></p> <p>Cue: <i>Respond 1-FCV-67-489 & 2-FCV-67-489 are closed, the leak is stopped.</i></p> <p>NOTE: Once Appendix G is complete, state that the leak is stopped.</p> <p>STANDARD: Operator notifies an AUO to close the valves to isolate the B ERCW header. This step is critical to isolate the ERCW leak.</p> <p>COMMENTS:</p> <p>Console Operator perform the following to isolate the leak:</p> <p>MRF 3WRV489 0%</p> <p>MRF 3WR2V489 0%</p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Critical Step</p>
<p>STEP 15: [7] OPERATE available A Train ERCW Pumps to maintain pressure between 78 psig and 124 psig.</p> <p>STANDARD: Operator will start an additional A train pump. This step is critical to return ERCW supply header pressure to normal.</p> <p>COMMENTS:</p> <p>Pressure is less than 78 psig, but procedure also allows reducing flow to non-essential equipment to raise pressure.</p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Critical Step</p>

Job Performance Checklist:

STEP/STANDARD	SAT/UNSAT
<p>STEP 16.: [8] EVALUATE aligning Train A ERCW to supply Train B:</p> <p>a. IF aligning 1A to 2B header is desired, THEN PERFORM the following:</p> <ol style="list-style-type: none"> 1) DISPATCH personnel to CLOSE 0-67-1501 CCS Htx 0B2 Inlet valve. 2) WHEN 0-67-1501 CLOSED, THEN OPEN 1-FCV-67-147, Hdr 1A to Hdr 2B Isol Valve [Rx MOV Bd 1A2-A c/9A] AND RECORD the time 3) WHEN 1-FCV-67-147 has been OPEN for approximately 10 minutes, THEN OPEN 0-67-1501 CCS Htx 0B2 Inlet valve <p>Cue: <i>Direct operator to align 1A and 2A ERCW Supplies to Train B</i></p> <p>Cue: <i>Play role of AUO and acknowledge the request. When 1-FCV-67-147 has been directed opened, cue that 10 minutes have elapsed.</i></p> <p>STANDARD: Operator dispatches an AUO to close 0-67-1501, open 1-FCV-67-147 and reopens 0-67-1501 after 1-FCV-67-147 has been open for ~ 10 minutes. This step is critical to supply cooling water to A train equipment.</p> <p>COMMENTS:</p> <p>Console Operator perform the following to open 1-FCV-67-147 (1-FCV-67-147 is already open):</p> <p>MRF RWRV489 100%</p> <div data-bbox="820 871 1209 1155" style="background-color: yellow; padding: 5px; margin-top: 10px;"> <p><i>This cue is correct.</i></p> <p><i>Leak is on 'B' Train upstream of strainer.</i></p> </div>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Critical Step</p>
<p>STEP 17.:</p> <p>b. IF aligning 2A to 1B header is desired, THEN PERFORM the following:</p> <ul style="list-style-type: none"> ▪ OPEN 1-FCV-67-424, Hdr 1B to Hdr 2A CCS HX Isol Valve [Rx MOV Bd 1A2-A Compt. 9B] AND RECORD the Time ▪ ENSURE 1-FCV-67-223, Hdr 1B to Hdr 2A Isol Valve is OPEN. [Rx MOV Bd 1A2-A Compt. 8B]. ▪ ENSURE 2-FCV-67-223, Hdr 2A to Hdr 1B Isol Valve is OPEN. [Rx MOV Bd 2A2-A Compt. 8B]. <p>Cue: <i>Play role of AUO and acknowledge the request.</i></p> <p>STANDARD: Operator dispatches an AUO to open 1-FCV-67-424, and ensures that 1-FCV-67-223 and 2-FCV-67-223 are open. This step is critical to supply cooling water to A train equipment.</p> <p>COMMENTS:</p> <p>Console Operator perform the following to open 1-FCV-67-424 (1/2-FCV-67-223 are already open):</p> <p>MRF RWRV424 100%</p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Critical Step</p>

Job Performance Checklist:

STEP/STANDARD	SAT/UNSAT
<p>STEP 18.: [9] START additional Lower Compartment Cooling Fans and CRDM Fans as required to maintain containment temperature.</p> <p>STANDARD: Operator checks containment temperature and starts fans if needed.</p> <p>NOTE: Operator may start the 1C Lower Compartment Cooler.</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p>
<p>STEP 19.: [10] MONITOR Containment Pressure and Temperature.</p> <p>STANDARD: Operator monitors containment temperature and pressure.</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p>
<p>STEP 20.: [11] CHECK 1A and 2A ERCW header pressures and flows adequate for current alignment:</p> <ul style="list-style-type: none"> • 1-FI-67-61 and 2-FI-67-61, at expected value • 1-PI-67-493 and 2-PI-67-493 <p>STANDARD: Operator checks above indicators and observes parameters are normal. If not starts additional A train ERCW pumps (see JPM step 15).</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p>
<p>STEP 21.: [12] RESTORE equipment:</p> <ol style="list-style-type: none"> CHECK Train B ERCW header supplied from Train A crosstie. RESTORE the following hand switches as applicable: <ul style="list-style-type: none"> • 1B-B CCP to A-AUTO • 1B-B SI Pump to A-AUTO • 2B-B CCP to A-AUTO • 2B-B SI Pump to A-AUTO <p>Cue: <i>Play role of AUO and acknowledge the request.</i></p> <p>STANDARD: Operator restores B Train components to service. This step is critical to restore B train ECCS equipment.</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Critical Step</p>

Job Performance Checklist:

STEP/STANDARD	SAT/UNSAT
<p>STEP 22.: [13] EVALUATE isolation of non-essential A Train CCS heat loads USING Appendix E, CCS Heat Load Reduction.</p> <p><u>Cue:</u> <i>SM will perform the evaluation</i></p> <p><u>STANDARD:</u> Operator ensures Appendix E evaluated.</p> <p><u>COMMENTS:</u></p>	<p>___ SAT</p> <p>___ UNSAT</p>
<p>STEP 23.: [14] ENSURE all ACBs opened USING the following appendixes:</p> <ul style="list-style-type: none"> Appendix F, ERCW Rx MOV Board Appendix R Valves Appendix G, ERCW MCC Appendix R Valves <p><u>Cue:</u> <i>Play role of AUO and acknowledge the request.</i></p> <p><u>STANDARD:</u> Operator dispatches an AUO to perform the appendixes.</p> <p><u>COMMENTS:</u></p>	<p>___ SAT</p> <p>___ UNSAT</p>
<p>STEP 24.: [15] REFER to the following:</p> <ul style="list-style-type: none"> Appendix B, Affected Equipment List (Header 1B) Appendix D, Affected Equipment List (Header 2B) Appendix P, Potential Tech Spec Impacts <p><u>Cue:</u> <i>SM will refer to the Appendixes.</i></p> <p><u>STANDARD:</u> Operator ensures Appendix B referred to.</p> <p><u>COMMENTS:</u></p>	<p>___ SAT</p> <p>___ UNSAT</p>
<p>STEP 25.: [16] REFER TO AOP-M.03, Loss of Component Cooling Water.</p> <p><u>Cue:</u> <i>Another operator will evaluate to AOP-M.03.</i></p> <p><u>STANDARD:</u> Operator ensures AOP-M.03 referred to.</p> <p><u>COMMENTS:</u></p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Stop Time___</p>

End of JPM

CANDIDATE CUE SHEET
(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

DIRECTION TO TRAINEE:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the handout sheet I provided you.

INITIAL CONDITIONS:

Unit is in mode 1 at 100% power

INITIATING CUES:

You are the CRO and are to monitor the board and respond, as a reader/doer, to any event that may occur.

Inform SM when any required action(s) associated with the failure have been completed

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT
AOI PROGRAM MANUAL
ABNORMAL OPERATING PROCEDURES

AOP-M.01

LOSS OF ESSENTIAL RAW COOLING WATER

Revision 15

QUALITY RELATED

PREPARED/PROOFREAD BY: D. A. PORTER

RESPONSIBLE ORGANIZATION: OPERATIONS

APPROVED BY: W. T. LEARY

EFFECTIVE DATE: 07/21/06

REVISION

DESCRIPTION: Incorporated various enhancements to Sect. 2.11 based upon feedback from REP drill (PER 97828, NB-060173, NB-060178). Relocated caution, notes, and administrative actions from Section 2.0. Incorporated other enhancements and minor corrections.

**INTENT CHANGES TO SECTION 2.11 OF THIS PROCEDURE
MUST BE APPROVED BY PORC.**

SQN	LOSS OF ESSENTIAL RAW COOLING WATER	AOP-M.01 Rev. 15
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1.0 PURPOSE

This procedure provides the actions necessary to mitigate the effects of an ERCW pump or piping failure.

SQN	LOSS OF ESSENTIAL RAW COOLING WATER	AOP-M.01 Rev. 15
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.0 OPERATOR ACTIONS

CAUTION: ERCW header rupture in Auxiliary Building could fill the passive sump in 15 minutes. Prompt action is needed.

1. DIAGNOSE the failure:

IF...	GO TO SECTION	PAGE
ERCW Pump(s) tripped or failed	2.1 ERCW pump failure	5
High flow ERCW Supply Header 1A	2.2 Supply Hdr 1A Failure to Aux Bldg	8
High flow ERCW Supply Header 1B	2.3 Supply Hdr 1B Failure to Aux Bldg	12
High flow ERCW Supply Header 2A	2.4 Supply Hdr 2A Failure to Aux Bldg	16
High flow ERCW Supply Header 2B	2.5 Supply Hdr 2B Failure to Aux Bldg	22
Indications of an ERCW Return Header rupture (must be diagnosed locally since M-27 indications are not affected)	2.6 Return Hdr rupture in Aux Bldg	27
Low flow ERCW Supply Header 1A and 2A, AND STRAINER DIFF PRESS HIGH alarm LIT [M-27A, C-3 and/or D-2]	2.7 Supply Header 1A/2A Failure in Yard Area	38
Low flow ERCW Supply Header 1B and 2B, AND STRAINER DIFF PRESS HIGH alarm LIT [M-27A, C-6 and/or D-5]	2.8 Supply Header 1B/2B Failure in Yard Area	52

(step continued on next page)

SQN	LOSS OF ESSENTIAL RAW COOLING WATER	AOP-M.01 Rev. 15
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.0 OPERATOR ACTIONS (Continued)

3. (Continued)

IF...	GO TO SECTION	PAGE
<p>Low flow ERCW supply headers 1A and 2A, AND STRAINER DIFF PRESS alarms DARK [M-27A, C-3 and D-2], AND at least one of the following alarms LIT:</p> <ul style="list-style-type: none"> • ERCW DECK SUMP LEVEL HI alarm LIT [1-M-15B, A-3] OR • ERCW DECK SUMP PMP RUNNING [1-M-15B, D-2 or D-4] OR • MECH EQUIP SUMP LVL HI alarm LIT [1-M-15A, B-6] 	2.9 Supply Header A Failure Upstream of Strainer Inlet Valves	63
<p>Low flow ERCW supply headers 1B and 2B, AND STRAINER DIFF PRESS alarms DARK [M-27A, C-6 and D-5], AND at least one of the following alarms LIT:</p> <ul style="list-style-type: none"> • ERCW DECK SUMP LEVEL HI alarm LIT [1-M-15B, A-3] OR • ERCW DECK SUMP PMP RUNNING [1-M-15B, D-2 or D-4] OR • MECH EQUIP SUMP LVL HI alarm LIT [1-M-15A, B-6] 	2.10 Supply Header B Failure Upstream of Strainer Inlet Valves	71
Loss of flow on ALL ERCW supply headers in modes 1-4.	2.11 Loss of all ERCW flow	77

END OF SECTION

SQN	LOSS OF ESSENTIAL RAW COOLING WATER	AOP-M.01 Rev. 15
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.1 ERCW Pump Failure

1. **IDENTIFY** and **LOCK OUT** failed ERCW pump.

2. **START** additional ERCW pumps as required to maintain supply header pressure between 78 psig and 124 psig.

3. **CHECK** two Train A ERCW Pumps AVAILABLE.

IF less than two Train A ERCW Pumps available,

THEN

EVALUATE isolation of non-essential Train A CCS heat loads **USING** Appendix E, CCS Heat Load Reduction **[C.1]**

4. **CHECK** 1A and 2A ERCW supply header pressures and flows **NORMAL**:

a. Supply header pressures [between 78 psig and 124 psig]:

- 1-PI-67-493A
- 2-PI-67-493A

b. Supply header flows [expected value]:

- 1-FI-67-61
- 2-FI-67-61

IF BOTH 1A AND 2A ERCW Headers FAILED,

THEN

GO TO Section 2.9, ERCW Supply Header A Failure Prior to ERCW Strainer Inlet Valves.





IF 1A OR 2A ERCW Header FAILED,

THEN

RETURN TO Section 2.0 for diagnosis.



SQN	LOSS OF ESSENTIAL RAW COOLING WATER	AOP-M.01 Rev. 15
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2.1 ERCW Pump Failure (cont'd)		
5.	CHECK 1B and 2B ERCW supply header pressures and flows NORMAL: a. Supply header pressures [between 78 psig and 124 psig]: <ul style="list-style-type: none"> • 1-PI-67-488A • 2-PI-67-488A b. Supply header flows [expected value]: <ul style="list-style-type: none"> • 1-FI-67-62 • 2-FI-67-62 	IF BOTH 1B AND 2B ERCW Headers FAILED, THEN GO TO Section 2.10, ERCW Supply Header B Failure Prior to ERCW Strainer Inlet Valves.  IF 1B OR 2B ERCW Header FAILED, THEN RETURN TO Section 2.0 for diagnosis. 
6.	DISPATCH personnel to INSPECT failed pump(s) and determine cause for failure.	
7.	NOTIFY STA to evaluate Tech Spec LCO 3.7.4, ERCW System.	
8.	CHECK ERCW pump loading amps NORMAL.	INVESTIGATE abnormal amp readings: <ul style="list-style-type: none"> • CHECK header flows and pressures. IF amps are high due to only one pump available, THEN EVALUATE isolation of non-essential ERCW loads.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.1 ERCW Pump Failure (cont'd)

9. **TRANSFER** emergency power selector switch away from failed pump.
10. **EVALUATE** need to close and place clearance on manual discharge valve for failed pump.
11. **GO TO** appropriate plant procedure.



END OF SECTION

SQN	LOSS OF ESSENTIAL RAW COOLING WATER	AOP-M.01 Rev. 15
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.2 ERCW Supply Header 1A Failure to Auxiliary Building

CAUTION: During operation, CCP and SI Pumps may experience bearing failure 10 minutes after a loss of ERCW cooling.

1. **DISPATCH** personnel to locate rupture.

2. **DISPATCH** operators with radios to perform Appendix F, Rx MOV Bd ERCW Valves.
[Aux Bldg, 749' elev, Rx MOV Boards].

3. **ENSURE** 1B-B CCP is running.

4. **STOP** and **LOCK OUT** the following:
 - 1A-A CCP
 - 1A-A SI Pump

5. **DISPATCH** operator to place Aux Air Compressor A-A in SAFE-STOP.
[AB el. 734', Refuel Floor]

6. **START** additional Lower Compartment Cooling Fans and CRDM Fans as required to maintain containment temperature.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.2 ERCW Supply Header 1A Failure to Auxiliary Building (cont'd)

NOTE: This section isolates ruptures in the Auxiliary Building downstream of 1-FCV-67-81. A rupture in the AB pipe tunnel upstream of 1-FCV-67-81 and downstream of the flow elements is isolated using Section 2.7 (Train A) for yard area breaks.

7. **NOTIFY** local operator to CLOSE
1-FCV-67-81, Aux Bldg Hdr 1A Isol Valve
[Rx MOV Bd 1A2-A Compt 3C]

8. **CHECK** rupture ISOLATED.

IF rupture is upstream of 1-FCV-67-81,
THEN
GO TO Section 2.7.



9. **NOTIFY** local operator to CLOSE
the following valves:

- 1-FCV-67-147, Hdr 1A to Hdr 2B Isol Valve [Rx MOV Bd 1A2-A Compt. 9A]
- 1-FCV-67-127, Hdr 1A Supply to Space Coolers, A/C, & Air Compressors [Rx MOV Bd 1A2-A Compt. 7A]

10. **ENSURE** the following valves are
CLOSED:

- 1-FCV-67-125, Containment Spray HX 1A ERCW Supply [0-M-27A]
- 1-FCV-67-99, Lower Compt Cooler 1C Supply Isol [0-M-27A]
- 1-FCV-67-107, Lower Compt Cooler 1A Supply Isol [0-M-27A]

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.2 ERCW Supply Header 1A Failure to Auxiliary Building (cont'd)

11. **DISPATCH** an operator to CLOSE the following valves:

- 1-67-524A, Supply Hdr 1A to Inst Room Cooler 1A [el. 669' Penetration Room, above 1B-B Disch Ductwork]
- 1-67-521A, Hypochlorite Treatment Circulation Line Isolation [elev 669' TDAFWP Rm N Wall near AFW 1-FCV-3-136A]
- 1-67-675, ERCW Isol to A Shutdown Board Room A/C Water Chiller [elev 714' near AFW LCV 1-LCV-3-148]

12. **OPERATE** ERCW Pumps as necessary to perform the following:

- **CONTROL** pressure between 78 psig and 124 psig.
- **MAINTAIN** support of system loads.

13. **REFER TO** the following:

- Appendix A, Affected Equipment List (Header 1A)
- Appendix P, Potential Tech Spec Impacts.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.2 ERCW Supply Header 1A Failure to Auxiliary Building (cont'd)

14. **ENSURE** all breakers reopened
USING Appendix F, Rx MOV Board
ERCW Valves.

15. **GO TO** appropriate plant procedure.



END OF SECTION

SQN	LOSS OF ESSENTIAL RAW COOLING WATER	AOP-M.01 Rev. 15
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.3 ERCW Supply Header 1B Failure to Auxiliary Building

CAUTION: During operation, CCP and SI Pumps may experience bearing failure 10 minutes after loss of ERCW cooling.

1. **DISPATCH** personnel to locate failure.

2. **DISPATCH** operators with radios to perform Appendix F, Rx MOV Board ERCW Valves. [Aux Bldg el. 749', Rx MOV Boards].

3. **ENSURE** 1A-A CCP RUNNING.

4. **STOP** and **LOCK OUT** the following:
 - 1B-B CCP
 - 1B-B SI Pump

5. **START** additional Lower Compartment Cooling Fans and CRDM Fans as required to maintain containment temperature.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.3 ERCW Supply Header 1B Failure to Auxiliary Building (cont'd)

NOTE: This section isolates ruptures downstream of 1-FCV-67-82. A rupture in the AB pipe tunnel upstream of 1-FCV-67-82 and downstream of the flow elements is isolated using Section 2.8 for yard area breaks.

6. **NOTIFY** local operator to CLOSE
1-FCV-67-82, Aux Bldg Hdr 1B Isol Valve
[Rx MOV Bd 1B2-B Compt 3C]

7. **CHECK** rupture ISOLATED.

IF rupture is upstream of 1-FCV-67-82,
THEN
GO TO Section 2.8.



8. **NOTIFY** local operator to CLOSE
the following valves:

- 1-FCV-67-424, Hdr 1B to Hdr 2A
Isol Valve
[Rx MOV Bd 1A2-A Compt. 9B]
- 1-FCV-67-128, Hdr 1B Supply
to Space Coolers, A/C, & Air Compressors
[Rx MOV Bd 1B2-B Compt. 6C]

9. **ENSURE** the following valves CLOSED:

- 1-FCV-67-123, Containment Spray
HX 1B ERCW Supply [0-M-27A]
- 1-FCV-67-83, Lower Compt Cooler
1D Supply Isol [0-M-27A]
- 1-FCV-67-91, Lower Compt Cooler
1B Supply Isol [0-M-27A]

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.3 ERCW Supply Header 1B Failure to Auxiliary Building (cont'd)

10. **DISPATCH** an operator to CLOSE the following valves:

- 1-67-524B, Supply Hdr 1B to Inst Room Cooler 1B [AB, 669' elev, Penetration Room, above 1B-B Disch Ductwork].
- 1-67-521B, Hypochlorite Treatment Circulation Line Isolation [elev 669' TDAFWP Rm North Wall]

11. **OPERATE** ERCW Pumps as necessary to perform the following:

- **CONTROL** pressure between 78 psig and 124 psig.
- **MAINTAIN** support of system loads.

12. **REFER TO** the following:

- Appendix B, Affected Equipment List (Header 1B)
- Appendix P, Potential Tech Spec Impacts.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.3 ERCW Supply Header 1B Failure to Auxiliary Building (cont'd)

13. **ENSURE** all breakers reopened
USING Appendix F, Rx MOV Board
ERCW Valves.

14. **GO TO** appropriate plant procedure.



END OF SECTION

SQN	LOSS OF ESSENTIAL RAW COOLING WATER	AOP-M.01 Rev. 15
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.4 ERCW Supply Header 2A Failure to Auxiliary Building

- CAUTIONS:**
- During operation, CCP and SI Pumps may experience bearing failure 10 minutes after loss of ERCW cooling.
 - Loss of 2A ERCW Supply Header affects both Units Train A CCS Heat Exchangers. Isolation of ruptured header and restoration of ERCW to intact CCS Heat Exchangers is time critical to prevent tripping both Units.
 - Isolation or realignment of 2A ERCW Header affects CCS cooling to RCPs.

1. **DISPATCH** personnel to locate failure.

2. **ENSURE** 2B-B CCP in service.

3. **STOP** and **LOCKOUT** the following pumps:

- 2A-A CCP
- 2A-A SI Pump

4. **DISPATCH** operators with radios to perform Appendix F, Rx MOV Bd ERCW Valves. [Aux Bldg, el. 749', Rx MOV Boards].

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.4 ERCW Supply Header 2A Failure to Auxiliary Building (cont'd)

5. MONITOR the following on both Units:

- REACTOR COOLANT PUMPS
MOTOR THRUST BEARING TEMP
HIGH [XA-55-5B, E-3] alarm DARK.

IF Thrust Bearing temperature
exceeds 200°F,

THEN

PERFORM the following:

- TRIP** the affected Unit's Rx.
- STOP** the affected Unit's RCPs.
- IF** in Mode 1, 2, or 3,
THEN
GO TO E-0, Reactor Trip or Safety
Injection, **WHILE** continuing with this
procedure. [C.2]



IF in Mode 4 or 5,

THEN

STABILIZE RCS temperature
USING RHR shutdown cooling.

NOTE The following step isolates the 2A ERCW supply to 1A1/1A2 CCS HX.
If rupture is NOT successfully isolated then step 7 RNO will cross-tie 1B and 2A
ERCW headers to supply the 1A1/1A2 CCS HX.

- 6. NOTIFY** local operator to CLOSE
2-FCV-67-223, Hdr 2A to Hdr 1B Isol
Valve. [Rx MOV Bd 2A2-A Compt. 8B]

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.4 ERCW Supply Header 2A Failure to Auxiliary Building (cont'd)

CAUTION Opening crosstie valve 1-FCV-67-424 (in Step 7.RNO) may result in severe fouling or flow blockage of 1A1/1A2 CCS Heat Exchanger. If plant conditions and time permits, CCS Hx 1A2 should be isolated prior to opening crosstie valve. After approximately 10 minutes, 1A2 CCS Hx will be returned to service.

NOTE When ERCW Headers are crosstied, the actions of LCO 3.0.3 are applicable. Steps to record time valve is opened should be used as aid for tracking LCO times.

7. **CHECK** Supply Header 2A parameters to determine if rupture is ISOLATED:

- 2-FI-67-61 at expected value
- 2-PI-67-493A between 78 psig and 124 psig –

PERFORM the following:

a. **IF** CCS Hx 1A2 to be isolated prior to opening crosstie valve,
THEN

PERFORM the following:

- 1) **CLOSE** 1-67-1501 CCS Hx 1A2 Inlet Isol Vlv.
- 2) **WHEN** 1-67-1501 CLOSED,
THEN
OPEN 1-FCV-67-424, Hdr 1B to Hdr 2A CCS HX Isol Valve. [Rx MOV Bd 1A2-A Compt. 9B]
- 3) **RECORD** time _____
- 4) **IF** CCS Hx 1A1 indicates fouling or flow blockage **OR** 1-FCV-67-424 has been **OPEN** for approx. 10 minutes,
THEN
OPEN 1-67-1501 Inlet to 1A2 CCS Hx.
- 5) **GO TO** Substep c.



b. **OPEN** 1-FCV-67-424, Hdr 1B to Hdr 2A CCS HX Isol Valve
[Rx MOV Bd 1A2-A Compt. 9B].

RECORD time _____

(Step Continued on next page)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.4 ERCW Supply Header 2A Failure to Auxiliary Building (cont'd)

7. (Continued)

- c. **TRIP** Unit 2 Rx.
- d. **STOP** Unit 2 RCPs.
- e. **IF** Unit 2 was in Mode 1, 2, or 3,
THEN
GO TO E-0, Reactor Trip or Safety Injection,
WHILE continuing with this procedure. [C.2]



- f. **IF** in Mode 4 or 5,
THEN
STABILIZE RCS temperature using RHR
shutdown cooling.
- g. **CLOSE** the following valves:
 - 2-FCV-67-81, Aux Bldg Hdr 2A Isol Valve.
[Rx MOV Bd 2A2-A Compt. 3C]
 - 2-FCV-67-127, Hdr 2A Supply to Space
Coolers, A/C, & Air Compressors
[Rx MOV Bd 2A2-A Compt. 7A]
 - 2-FCV-67-146, 2A-1/2A-2 CCS
HX Outlet Isol [0-M-27A]
 - 2-FCV-67-125, Containment Spray
HX 2A ERCW Supply [0-M-27A]
 - 2-FCV-67-99, Lower Compt
Cooler 2C Supply Isol [0-M-27A]
 - 2-FCV-67-107, Lower Compt
Cooler 2A Supply Isol [0-M-27A]
 - 2-FCV-67-130, Upper Compt
Cooler 2A Supply Isol [0-M-27A]
 - 2-FCV-67-133, Upper Compt
Cooler 2C Supply Isol [0-M-27A]

(step continued on next page)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.4 ERCW Supply Header 2A Failure to Auxiliary Building (cont'd)

7. (Continued)

h. **DISPATCH** an operator to **CLOSE** the following valves:

- 2-67-524A, Supply Hdr 2A to Inst Room Cooler 2A. [Aux Bldg el. 669' Pen Rm, above Ductwork by panel 2-L-329]
- 2-67-521A, Hypochlorite Treatment Circulation Line Isolation [el. 669' TDAFWP Rm by ERCW supply valves]

i. **GO TO** Step 10.



8. **CLOSE** 1-FCV-67-146, 1A1/1A2 CCS HX Outlet Isol.

9. Unit 1 Only:
PERFORM the following:

a. **TRIP** Unit 1 reactor.

b. **STOP** Unit 1 RCPs.

c. **CHECK** if in Mode 1, 2, or 3.

c. **STABILIZE** RCS temperature **USING** RHR shutdown cooling.


GO TO Step 10.



d. **GO TO** E-0, Reactor Trip or Safety Injection, **WHILE** continuing in this procedure. [C.2]



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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2.4 ERCW Supply Header 2A Failure to Auxiliary Building (cont'd)		
10.	OPERATE Train A and B ERCW Pumps as necessary to perform the following: <ul style="list-style-type: none"> • CONTROL pressure between 78 psig and 124 psig. • MAINTAIN support of system loads. 	IF ERCW pressure is high, THEN EVALUATE opening ERCW supply to Containment Spray HX and/or DG HXs to reduce pressure.
11.	START additional Lower Compartment Cooling Fans and CRDM Fans as required to maintain containment temperature.	
12.	REFER to the following: <ul style="list-style-type: none"> • Appendix C, Affected Equipment List (Header 2A) • Appendix P, Potential Tech Spec Impacts. 	
13.	ENSURE all breakers reopened USING Appendix F, Rx MOV Board ERCW Valves.	
14.	REFER TO AOP-M.03, Loss of Component Cooling Water.	
15.	GO TO appropriate plant procedure. 	
END OF SECTION		

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.5 ERCW Supply Header 2B Failure to Auxiliary Building

CAUTION: During operation, CCP and SI Pumps may experience bearing failure 10 minutes after loss of ERCW cooling.

1. **DISPATCH** personnel to locate rupture.

2. **DISPATCH** operators with radios to perform Appendix F, Rx MOV Board ERCW Valves. [Aux Bldg el. 749', Rx MOV Boards].

3. **ENSURE** 2A-A CCP RUNNING.

4. **STOP** and **LOCK OUT** the following:

- 2B-B CCP
- 2B-B SI Pump

5. **DISPATCH** operator to place Aux Air Compressor B-B in SAFE STOP. [Aux Bldg, 734' elev, Refuel Floor]

NOTE The following step removes all cooling water from the 0B1/0B2 CCS HX.

6. **CLOSE** 2-FCV-67-147, Hdr 2B to Hdr 1A Isol Valve. [Rx MOV Bd 2B2-B Compt. 3B].

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.5 ERCW Supply Header 2B Failure to Auxiliary Building (cont'd)

CAUTION 1 Crosstying A and B train ERCW supply headers should only be performed if cooling is urgently required for Unit 1 Train B CCS related equipment. LCO 3.0.3 may be applicable.

CAUTION 2 Opening of crosstie valve 1-FCV-67-147 (in Step 7.RNO) may result in fouling or blockage of 0B1/0B2 CCS Hx. If time permits, CCS Hx 0B2 should be isolated prior to opening crosstie valve to prevent fouling BOTH heat exchangers. After approx. 10 min, 0B2 CCS Hx will be returned to service.

NOTE ERCW flow on 2B header will be very low if rupture was isolated in previous step.

7. **CHECK** ERCW Supply Hdr 2B parameters to determine if Rupture ISOLATED: _

- 2-FI-67-62, at expected value
- 2-PI-67-488A between 78 psig and 124 psig.

a. **CLOSE** 2-FCV-67-82, Aux Bldg Hdr 2B Isol Valve. [Rx MOV Bd 2B2-B Compt. 3C]

b. **IF** desired to isolate 0B2 CCS Hx prior to opening crosstie valve, **THEN** **PERFORM** the following:

1) **CLOSE** 0-67-1501 CCS Hx 0B2 Inlet.

2) **WHEN** 0-67-1051 CLOSED, **THEN** **OPEN** 1-FCV-67-147, Hdr 1A to Hdr 2B Isol Valve. [Rx MOV Bd 1A2-A Compt. 9A].

RECORD time _____

3) **IF** CCS Hx 0B2 indicates fouling or flow blockage **OR** 1-FCV-67-147 has been OPEN for approximately 10 minutes, **THEN** **OPEN** 0-67-1501 CCS Hx 0B2 Inlet.

4) **GO TO** Substep d.



(Step continued on next page)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.5 ERCW Supply Header 2B Failure to Auxiliary Building (cont'd)

7. (Continued)

- c. **EVALUATE** opening 1-FCV-67-147, Hdr 1A to Hdr 2B Isol Valve [Rx MOV Bd 1A2-A Compt. 9A].

RECORD time _____

- d. **IF** desired,
THEN
PLACE 0-FCV-67-152 in the 35% position.

- e. **CLOSE** the following valves:

- 2-FCV-67-128, Hdr 2B Supply to Space Coolers, A/C & Air Compressors [Rx MOV Bd 2B2-B Compt. 6C]
- 2-FCV-67-123, Containment Spray HX 2B ERCW Supply [0-M-27A]
- 2-FCV-67-83, Lower Compt Cooler 2D Supply Isol [0-M-27A]
- 2-FCV-67-91, Lower Compt Cooler 2B Supply Isol [0-M-27A]
- 2-FCV-67-138, Upper Compt Cooler 2B Supply Isol [0-M-27A]
- 2-FCV-67-141, Upper Compt Cooler 2D Supply Isol [0-M-27A]

(Step continued on next page)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.5 ERCW Supply Header 2B Failure to Auxiliary Building (cont'd)

7. (Continued)

f. **DISPATCH** an operator to **CLOSE** the following valves:

- 2-67-524B, Supply Hdr 2B to Inst Room Cooler 2B
[Aux Bldg, 669' elev, Penetration Room, above Ductwork by panel 2-L-26A].
- 2-67-675, ERCW Isol to B Shutdown Board Room A/C Water Chiller
[Aux Bldg, elev 714' 12' up at Col R-A-12].
- 2-67-521B, Hypochlorite Treatment Circulation Line Isol
[elev 669' TDAFWP Rm by ERCW supply valves]

g. **IF** 1A ERCW header was aligned to 0B1/0B2 CCS HX,
THEN
GO TO Step 9.



8. **ENSURE** the following valves are closed:

- 0-FCV-67-152, CCS HX 0B1/0B2 Disch Valve to Hdr B
- 0-FCV-67-151, CCS HX 0B1/0B2 Disch Valve to Hdr A
[Rx MOV Bd 1A2-A Compt. 8D]

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.5 ERCW Supply Header 2B Failure to Auxiliary Building (cont'd)

9. **START** additional Lower Compartment Cooling Fans and CRDM Fans as required to maintain containment temperature.

10. **OPERATE** ERCW Pumps as necessary to perform the following:

- **CONTROL** pressure between 78 psig and 124 psig.
- **MAINTAIN** support of system loads

IF ERCW header pressure is high,
THEN

EVALUATE opening ERCW supply to Containment Spray HX and/or DG HXs to reduce pressure.

11. **REFER TO** the following:

- Appendix D, Affected Equipment List (Header 2B)
- Appendix P, Potential Tech Spec Impacts.

12. **ENSURE** all breakers reopened **USING** Appendix F, Rx MOV Board ERCW Valves.

13. **REFER** to AOP-M.03, Loss of Component Cooling Water.

14. **GO TO** appropriate plant procedure.



END OF SECTION

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.6 ERCW Return Header Rupture in the Auxiliary Building

- CAUTIONS:**
- During operation, CCP and SI Pumps may experience bearing failure 10 minutes after loss of ERCW cooling.
 - Loss of 2A ERCW Supply Header affects both Units Train A CCS Heat Exchangers.

- NOTES**
- ERCW supply and return headers are located in the pipe tunnels above the TDAFWP rooms.

Pipe Tunnel	Supply Header	Return Header
Unit 1	1A and 1B	A
Unit 2	2A and 2B	B

- MCR indications on M-27 are not indicative of a return header rupture. Field observation is required to identify rupture size and location.
1. **DISPATCH** personnel to locate rupture.
 2. **DISPATCH** operators with radios to perform the following:
 - Appendix F, Rx MOV Board ERCW Valves. [Aux Bldg, 749' elev]
 - Appendix H, Diesel Aux Bd ERCW Valves [Diesel Bldg]

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.6 ERCW Return Header Rupture in the Auxiliary Building (cont'd)

CAUTION 1 Opening crosstie valve 1-FCV-67-424 in the following step may result in severe fouling or flow blockage of 1A1/1A2 CCS Heat Exchanger, therefore, the CCS Hx 1A2 should be isolated prior to opening. After approximately 10 minutes 1A2 CCS Hx will be returned to service.

CAUTION 2 Isolation or realignment of 2A ERCW Supply Header will result in loss of ERCW Cooling water to all Train A CCS HX and therefore, a loss of CCS cooling to the RCPs.

CAUTION 3 The effects of flooding and loss of cooling to critical components should be evaluated prior to initiating actions to isolate or crosstie ERCW headers.

- NOTES:**
- Rupture of Return Header 'A' will result in Unit 2 being tripped. Aligning 1B ERCW supply header to 1A CCS HX allows Unit 1 time to perform a controlled shutdown.
 - When ERCW Headers are crosstied the actions of LCO 3.0.3 are applicable. Steps to record the time a valve is opened should be used as an aid for tracking LCO action times.

3. **DETERMINE** if isolation of ERCW Return Header A is required:

a. **CHECK** for rupture on ERCW Return Header A (based upon break location and reports from personnel in field).

a. **GO TO** Step 4.



b. **ENSURE** 1B-B and 2B-B CCPs RUNNING.

c. **STOP** and **LOCK OUT** the following:

- 1A-A CCP
- 2A-A CCP
- 1A-A SI Pump
- 2A-A SI Pump

(step continued on next page)

SQN	LOSS OF ESSENTIAL RAW COOLING WATER	AOP-M.01 Rev. 15
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.6 ERCW Return Header Rupture in the Auxiliary Building (cont'd)

3. d. **DISPATCH** operator to place
Aux Air Compressor A-A in SAFE STOP.
[Aux Bldg el 734', Refuel Floor]
- e. **ALIGN** 1B ERCW to 1A1/1A2 CCS HX:
 - 1) **DISPATCH** personnel to CLOSE
1-67-1501 CCS Hx 1A2
Inlet Isol Vlv.
 - 2) **WHEN** 1-67-1501 CLOSED,
THEN
OPEN 1-FCV-67-424, Hdr B to Hdr 2A
CCS HX Isol Valve
[Rx MOV Bd 1A2-A Compt. 9B]

RECORD time _____
 - 3) **WHEN** 1-FCV-67-424 has been OPEN
for approximately 10 minutes,
THEN
OPEN 1-67-1501 Inlet to 1A2 CCS Hx.
- f. **ISOLATE** Aux Bldg 1A and 2A Headers:
 - **CLOSE** 1-FCV-67-81, Aux Bldg
Hdr 1A Isol Valve. [Rx MOV Bd 1A2-A
Compt. 3C]
 - **CLOSE** 1-FCV-67-223, Hdr 1B to
Hdr 2A Isol Valve. [Rx MOV Bd 1A2-A
Compt. 8B]
 - **CLOSE** 2-FCV-67-81, Aux Bldg
Hdr 2A Isol Valve
[Rx MOV Bd 2A2-A Compt. 3C].
- g. **ENSURE** only one Train A ERCW pump
RUNNING.

(Step continued on next page)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.6 ERCW Return Header Rupture in the Auxiliary Building (cont'd)

NOTE: Substep h provides protection for the in service Train A ERCW pump by providing a flow path through the D/G HX.

3. h. **OPEN** A train ERCW supplies to D/G HXs to provide a flow path for running Train A ERCW pump:

ERCW Headers		
DG	NOR Supply	ALT Supply
1A-A	1-FCV-67-66	
2A-A	2-FCV-67-66	
1B-B		1-FCV-67-65
2B-B		2-FCV-67-65

- i. **OPERATE** ERCW pumps as necessary to perform the following:

- **CONTROL** pressure between 78 psig and 124 psig.
- **MAINTAIN** support system loads.

NOTE: Unit 2 will be tripped due to lack of ERCW to the CCS HX 2A1/2A2.

- j. Unit 2 Only:
PERFORM the following:

- 1) **TRIP** reactor.
- 2) **STOP** RCPs.
- 3) **GO TO** E-0, Reactor Trip or Safety Injection.



(Step continued on next page.)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.6 ERCW Return Header Rupture in the Auxiliary Building (cont'd)

3. k. **ENSURE** CCS HX 0B1/0B2 Discharge aligned to Hdr B:
 - **ENSURE** 0-FCV-67-152, CCS HX 0B1/0B2 Disch Valve to Hdr B OPEN
 - **ENSURE** 0-FCV-67-151, CCS HX 0B1/0B2 Disch Valve to Hdr A CLOSED. [Rx MOV Bd 1A2-A Compt. 8D].
- l. **CLOSE** Header A Discharge to Cold Water Channel Isolations:
 - 0-FCV-67-12 [Diesel Aux Bd 2A2-A Compt. 3C]
 - 0-FCV-67-364 [Diesel Aux Bd 2B2-B Compt. 4B]
- m. **DISPATCH** an operator to CLOSE DG returns to Hdr A: [Diesel Bldg, outside DG Rooms]:
 - 1-67-511A, 1A DG
 - 1-67-516A, 1B DG
 - 2-67-511A, 2A DG
 - 2-67-516A, 2B DG
- n. **REFER TO** following appendixes:
 - Appendix A, Affected Equipment List (Header 1A)
 - Appendix C, Affected Equipment List (Header 2A)
- o. **GO TO** Step 5.



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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.6 ERCW Return Header Rupture in the Auxiliary Building (cont'd)

CAUTION: The effects of flooding and loss of cooling to critical components should be evaluated prior to initiating actions to isolate or cross tie ERCW headers.

- NOTES:**
- MCR indications on M-27 are not indicative of a return header rupture. Field observation is required to identify rupture size and location.
 - Rupture of Return Header B will require Unit 1 to be tripped in substep 4.i due the unavailability of cooling water for 1A1/1A2 CCS HX.

4. **DETERMINE** if isolation of ERCW Return Header B is required:

- CHECK** for rupture on ERCW Return Header B (based upon break location and reports from personnel in field).
- ENSURE** 1A-A and 2A-A CCPs RUNNING.
- STOP** and **LOCK OUT** the following:
 - 1B-B CCP
 - 2B-B CCP
 - 1B-B SI Pump
 - 2B-B SI Pump
- PLACE** Aux Air Compressor B-B in SAFE STOP. [Aux Bldg el 734', Refuel Floor]
- ISOLATE** Aux Bldg 1B and 2B Headers:
 - **CLOSE** 1-FCV-67-82, Aux Bldg Hdr 1B Isol Valve. [Rx MOV Bd 1B2-B Compt. 3C]
 - **CLOSE** 2-FCV-67-82, Aux Bldg Hdr 2B Isol Valve [Rx MOV Bd 2B2-B Compt. 3C].

a. **GO TO** Step 5.



(step continued on next page)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.6 ERCW Return Header Rupture in the Auxiliary Building (cont'd)

NOTE: CCS HX 1A1/1A2 outlet flow is to Discharge Header B. The following substep isolates ERCW to this HX.

4. f. **CLOSE** 1-FCV-67-223, Hdr 1B to Hdr 2A Isol Valve [Rx MOV Bd 1A2-A Compt. 8B].

- g. **ENSURE** only one Train B ERCW pump **RUNNING**.

NOTE: Substep h provides protection for the in service Train B ERCW pump by providing a flow path through the D/G HX.

- h. **OPEN** B train ERCW supplies to D/G HXs to provide a flow path for the running Train B ERCW pump:

ERCW Headers		
DG	NOR Supply	ALT Supply
1A-A		1-FCV-67-68
2A-A		2-FCV-67-68
1B-B	1-FCV-67-67	
2B-B	2-FCV-67-67	

NOTE: Unit 1 will be tripped due to lack of ERCW to the CCS HX 1A1/1A2.

- i. Unit 1 Only:
PERFORM the following:
- 1) **TRIP** reactor.
 - 2) **STOP** RCPs.
 - 3) **GO TO** E-0, Reactor Trip or Safety Injection.



(step continued on next page)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.6 ERCW Return Header Rupture in the Auxiliary Building (cont'd)

4. j. **CLOSE** Header B Discharge to Cold Water Channel Isolations:
 - 0-FCV-67-14. [Diesel Aux Bd 2B2-B Compt. 3C]
 - 0-FCV-67-365. [Diesel Aux Bd 2A2-A Compt. 4B]

- k. **DISPATCH** an operator to **CLOSE** DG returns to Hdr B:
[Diesel Bldg, outside DG Rooms]:
 - 1-67-516B, 1A DG
 - 1-67-511B, 1B DG
 - 2-67-516B, 2A DG
 - 2-67-511B, 2B DG.

- l. **REFER TO** following appendixes:
 - Appendix B, Affected Equipment List (Header 1B)
 - Appendix D, Affected Equipment List (Header 2B)

(step continued on next page)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.6 ERCW Return Header Rupture in the Auxiliary Building (cont'd)

NOTE: The following substep may be performed to provide cooling water to the Train B CCS HX, if it is urgently needed.

4. m. **IF** aligning cooling water to CCS HX 0B1/0B2 is desired,
THEN
PERFORM the following:
- 1) **ALIGN** outlet of CCS HX B to Discharge Header A:
 - **OPEN** 0-FCV-67-151, CCS HX 0B1/0B2 Disch Valve to Hdr A. [Rx MOV Bd 1A2-A Compt. 8D]
 - **CLOSE** 0-FCV-67-152, CCS HX 0B1/0B2 Disch Vlv to Hdr B.
 - 2) **CLOSE** the following valves:
 - 2-FCV-67-128, Hdr 2B Supply to Space Coolers, A/C & Air Comp. [Rx MOV Bd 2B2-B Compt. 6C]
 - 2-FCV-67-123, Containment Spray HX 2B ERCW Supply [0-M-27A]
 - 2-FCV-67-83, Lower Compt Cooler 2D Supply Isol [0-M-27A]
 - 2-FCV-67-91, Lower Compt Cooler 2B Supply Isol [0-M-27A]
 - 2-FCV-67-138, Upper Compt Cooler 2B Supply Isol [0-M-27A]
 - 2-FCV-67-141, Upper Compt Cooler 2D Supply Isol [0-M-27A]

(Step Continued on next page)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.6 ERCW Return Header Rupture in the Auxiliary Building (cont'd)

4. m. 3) **DISPATCH** personnel to CLOSE the following valves:
- 2-67-524B, Supply Hdr 2B to Inst Room Cooler 2B [Aux Bldg, 669' elev, Penetration Room, above Ductwork by panel 2-L-26A]
 - 2-67-521B, Hypochlorite Treatment Circulation Line Isolation [AB 669' TDAFWP Rm by ERCW Supply Valves]
 - -2-67-675, ERCW Isol to B Shutdown Board Room A/C Water Chiller [AB elev 714' 12' up, Col R-A12].
- 4) **OPEN** 2-FCV-67-82, Aux Bldg Hdr 2B Isol Valve [Rx MOV Bd 2B2-B Compt. 3C].

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.6 ERCW Return Header Rupture in the Auxiliary Building (cont'd)

5. **OPERATE** ERCW Pumps as necessary to perform the following:
 - **CONTROL** pressure between 78 psig and 124 psig.
 - **MAINTAIN** support of system loads.
6. **START** additional Lower Compartment Cooling Fans and CRDM Fans as required to maintain containment temperature.
7. **REFER TO** Appendix P, Potential Tech Spec Impacts.
8. **ENSURE** all breakers opened **USING** the following appendixes:
 - Appendix F, Rx MOV Board ERCW Valves
 - Appendix H, Diesel Auxiliary Board Valves [D/G Building]
9. **GO TO** appropriate plant procedure.



END OF SECTION

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.7 ERCW Supply Header 1A/2A Failure in Yard Area

- CAUTIONS:**
- During operation, CCP and SI Pumps may experience bearing failure 10 minutes after loss of ERCW cooling.
 - Loss of 2A ERCW Supply Header affects both Units' Train A CCS Heat Exchangers. Isolation of ruptured Unit and restoration of ERCW to intact CCS Heat Exchangers is time critical to prevent tripping both Units.

- NOTE:**
- Engineering may be able to identify ruptured yard header using yard piping drawings (17W300 series).

1. **DISPATCH** personnel to locate failure.
2. **DISPATCH** operators with radios to **PERFORM** the following appendixes:
 - Appendix F, Rx MOV Board ERCW Valves [Aux Bldg, 749' elev, Rx MOV Boards]
 - Appendix G, ERCW MCC Valves [ERCW Pumping Station]
3. **START** additional Train A ERCW Pumps as required to maintain pressure between 78 psig and 124 psig.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.7 ERCW Supply Header 1A/2A Failure in Yard Area (cont'd)

4. MONITOR the following on both Units:

- REACTOR COOLANT PUMPS
MOTOR THRUST BEARING TEMP
HIGH alarm DARK [XA-55-5B, E-3]

IF Thrust Bearing temperature
exceeds 200°F,

THEN

PERFORM the following:

- TRIP** the affected Unit's Rx.
- STOP** the affected Unit's RCPs.
- IF** in Mode 1, 2 or 3,
THEN
GO TO E-0, Reactor Trip or Safety
Injection, **WHILE** continuing in this
procedure. [C.2]



IF in Mode 4 or 5,

THEN

STABILIZE RCS temperature
USING Train B RHR shutdown cooling.

5. OPEN alternate ERCW supply for the 1A
and 2A DG HX to ensure cooling water is
available:

- 1-FCV-67-68 (1A DG)
- 2-FCV-67-68 (2A DG)

6. ENSURE 1B-B and 2B-B CCPs
RUNNING.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.7 ERCW Supply Header 1A/2A Failure in Yard Area (cont'd)

7. STOP and LOCK OUT the following:

- 1A-A CCP
- 1A-A SI Pump
- 2A-A CCP
- 2A-A SI Pump

8. DISPATCH operator to place Train A
Aux Air Compressor in SAFE STOP.
[Aux Bldg, 734' elev, Refuel Floor]

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.7 ERCW Supply Header 1A/2A Failure in Yard Area (cont'd)

CAUTION Opening crosstie valve 1-FCV-67-424 (in following step) may result in severe fouling/blockage of 1A1/1A2 CCS Heat Exchanger. If plant conditions and time permits, CCS Hx 1A2 should be isolated prior to opening crosstie valve. After approximately 10 minutes 1A2 CCS Hx will be returned to service.

- NOTE**
- Crosstying 1B and 2A ERCW headers before the ruptured header has been identified will ensure ERCW cooling is available to ALL Train A CCS HX. When ERCW Headers are crosstied the actions of LCO 3.0.3 are applicable. Steps to record the time valve is opened should be used as an aid for tracking LCO action times.
 - With CCS available to RCP oil coolers tripping both units can be avoided providing time for an orderly shutdown.

9. **EVALUATE** performing the following to crosstie 1B and 2A ERCW headers:

a. **IF** desired to isolate 1A2 CCS Hx prior to opening crosstie valve,

THEN

PERFORM the following:

- 1) **CLOSE** 1-67-1501 CCS Hx 1A2 Inlet Isol Vlv.
- 2) **WHEN** 1-67-1501 CLOSED,
THEN
OPEN 1-FCV-67-424, Hdr 1B to Hdr 2A CCS HX Isol Valve
[Rx MOV Bd 1A2-A Compt. 9B].
RECORD Time _____
- 3) **IF** CCS Hx 1A1 indicates fouling or blockage **OR** 1-FCV-67-424 has been **OPEN** for approximately 10 minutes,
THEN
OPEN 1-67-1501 Inlet to 1A2 CCS Hx.
- 4) **GO TO** Substep c.



(step continued on next page)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.7 ERCW Supply Header 1A/2A Failure in Yard Area (cont'd)

9. b. **OPEN** 1-FCV-67-424 and
RECORD Time _____
- c. **ENSURE** 1-FCV-67-223 is **OPEN**.
- d. **ENSURE** 2-FCV-67-223 is **OPEN**.
10. **MONITOR** ERCW header pressure
and flow:
 - **OPERATE** ERCW pumps as required.
11. **MONITOR** running CCP temperatures
on both units.
12. **START** additional lower containment cooler
fans and CRDM fans as necessary.

NOTE If the rupture is on the crosstie header at the CCW building (IPS), and is isolated in the following step, then restoration of the 1B and 2A ERCW headers to normal configuration must be performed as expeditiously as possible.

13. **ISOLATE** 1A/2A ERCW
Crosstie Header:
 - **CLOSE** 1-FCV-67-22, ERCW
Strainer 1A-A Isol Valve
[Rx MOV Bd 1A2-A Compt. 3A].
 - **CLOSE** 2-FCV-67-22, ERCW
Strainer 2A-A Isol Valve
[Rx MOV Bd 2A2-A Compt. 3A].

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.7 ERCW Supply Header 1A/2A Failure in Yard Area (cont'd)

14. **DO NOT CONTINUE UNTIL** Crosstie Header is isolated (Step 13 complete).

NOTE Number of pumps in service should be considered when evaluating header flows and pressures to determine if rupture is isolated.

15. **DETERMINE** if rupture is isolated:

- a. **CHECK** 1A and 2A ERCW supply header parameters **NORMAL**:
 - 1,2-FI-67-61 at expected value
 - 1,2-PI-67-493A between 78 psig and 124 psig
- b. **EVALUATE** flood damage at CCW Building (IPS).

- a. **GO TO** Notes prior to step 19.



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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.7 ERCW Supply Header 1A/2A Failure in Yard Area (cont'd)

NOTE: After isolation of a rupture on the ERCW crosstie header in the CCW building (IPS), 1B and 2A ERCW header alignment must be restored to normal configuration as expeditiously as possible.

16. **PERFORM** the following to restore 1B and 2A ERCW headers if they were crosstied:

a. **CHECK** 1B and 2A ERCW headers crosstied.

a. **GO TO** Step 17.



b. **CLOSE** 1-FCV-67-424 and
RECORD time _____

c. **ENSURE** 1-FCV-67-223 is OPEN.

d. **ENSURE** 2-FCV-67-223 is OPEN.

17. **CONTROL** ERCW pumps as required to maintain pressure between 78 psig and 124 psig.

18. **GO TO** appropriate plant procedure.



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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.7 ERCW Supply Header 1A/2A Failure in Yard Area (cont'd)

- NOTES:**
- Train A ERCW header failure in the yard area could result in all Train A header pressures indicating low. After ERCW crosstie header valves at CCW have been isolated, strainer HIGH DIFF PRESSURE alarm may indicate the failed header.
 - If no differential press alarms are illuminated, isolating 1A header first (in Step 20) would have the least effect on the plant.

19. **CHECK** Strainer Diff Press High alarms on 0-XA-55-27A are DARK:

- HEADER 1A-A STRAINER DIFF PRESS HIGH- window D-2
- HEADER 2A-A STRAINER DIFF PRESS HIGH- window C-3

IF window D-2 and C-3 are both illuminated,
THEN
GO TO step 20.



IF window D-2 is illuminated,
THEN

a. **ISOLATE** 1A ERCW Header rupture:

- **CLOSE** 1-FCV-67-492, Hdr 1A Isol Before Strainer. [ERCW MCC 1AA Compt. 3C].
- **CLOSE** 1-FCV-67-81, Hdr 1A Isol to Aux Bldg. [Rx MOV Bd 1A2-A Compt. 3C]

b. **GO TO** Note prior to step 22.



IF window C-3 is illuminated,
THEN

a. **ISOLATE** 2A ERCW Header rupture:

- **CLOSE** 2-FCV-67-492, Hdr 2A Isol Before Strainer. [ERCW MCC 2AA Compt. 3C].
- **CLOSE** 2-FCV-67-81, Hdr 2A Isol to Aux Bldg. [Rx MOV Bd 2A2-A Compt. 3C]

b. **GO TO** Note prior to step 21.



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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.7 ERCW Supply Header 1A/2A Failure in Yard Area (cont'd)

NOTE: If 1A ERCW header rupture is isolated in the following step, then restoration of 1B and 2A headers to normal configuration must be performed as expeditiously as possible.

20. ISOLATE 1A ERCW Header rupture:

- a. **CLOSE** the following valves
 - 1-FCV-67-492, Hdr 1A Isol Before Strainer [ERCW MCC 1AA Compt. 3C]
 - 1-FCV-67-81, Hdr 1A Isol to Aux Bldg [Rx MOV Bd 1A2-A Compt. 3C]
- b. **WHEN** valves are closed,
THEN
GO TO Note before step 22.



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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.7 ERCW Supply Header 1A/2A Failure in Yard Area (cont'd)

NOTE Number of pumps in service should be considered when evaluating header flows and pressures to determine if rupture is isolated.

21. **DETERMINE** if Rupture is isolated:

a. **CHECK** 1A ERCW header parameters at expected values:

- 1-FI-67-61
- 1-PI-67-493A

a. **RESTORE** 2A ERCW header:

- **OPEN** 2-FCV-67-492, Hdr 2A Isol Before Strainer. [ERCW MCC Bd 2AA Compt. 3C]
- **OPEN** 2-FCV-67-81, Hdr 2A Isol to Aux Bldg. [Rx MOV Bd 2A2-A Compt. 3A]

GO TO Step 20 to isolate 1A header.



b. **GO TO** step 25.



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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.7 ERCW Supply Header 1A/2A Failure in Yard Area (cont'd)

NOTE Number of pumps in service should be considered when evaluating header flows and pressures to determine if rupture is isolated.

22. **DETERMINE** if Rupture is isolated:

a. **CHECK** 2A ERCW header parameters at expected values:

- 2-FI-67-61 at expected value
- 2-PI-67-493A at expected value

a. **RESTORE** 1A ERCW Header:

- **OPEN** 1-FCV-67-492, Hdr 1A Isol Before Strainer. [ERCW MCC 1AA Compt. 3C]
- **OPEN** 1-FCV-67-81, Hdr 1A Isol to Aux Bldg. [Rx MOV Bd 1A2-A Compt. 3C]

ISOLATE 2A ERCW Header rupture:

- **CLOSE** 2-FCV-67-492, Hdr 2A Isol Before Strainer. [ERCW MCC 2AA Compt. 3C].
- **CLOSE** 2-FCV-67-81, Hdr 2A Isol to Aux Bldg. [Rx MOV Bd 2A2-A Compt. 3A]

GO TO Step 25.



b. **IF** 1B and 2A ERCW headers were crosstied,

THEN

PERFORM the following:

- 1) **CLOSE** 1-FCV-67-424 and **RECORD** time _____
- 2) **ENSURE** 1-FCV-67-223 is **OPEN**.
- 3) **ENSURE** 2-FCV-67-223 is **OPEN**.

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2.7 ERCW Supply Header 1A/2A Failure in Yard Area (cont'd)

CAUTION Crosstying 1A and 2B train ERCW supply headers should only be performed if cooling is urgently required for Unit 1 Train A Component Cooling Water related equipment. LCO 3.0.3 may be applicable.

23. **DETERMINE** if ERCW Hdr 2B should be aligned to supply 1A header:

a. **CHECK** if restoration of 1A ERCW header from Train B supply is required.

a. **GO TO** step 26.



b. **EVALUATE** performing the following to align 2B to 1A header:

- **ENSURE** 2-FCV-67-147, Hdr 2B to Hdr 1A OPEN. [Rx MOV Bd 2B2-B Compt. 3B]
- **OPEN** 1-FCV-67-147 [Rx MOV Bd 1A2-A Compt. 9A] and

RECORD Time _____

NOTE Due to the increased demand after headers are crosstied expect abnormal flow and pressure indications.

24. **CHECK** 2B ERCW header pressures and flows NORMAL:

- 2-FI-67-62, at expected value
- 2-PI-67-488A, between 78 psig and 124 psig

START additional "B" Train ERCW pumps as necessary

ISOLATE non-essential ERCW loads as necessary.

DO NOT CONTINUE UNTIL header pressure and flow are acceptable for the current alignment.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.7 ERCW Supply Header 1A/2A Failure in Yard Area (cont'd)

25. **RESTORE** equipment, with cooling water available, as desired for applicable Train A ERCW header:

- 1A CCP to A-AUTO
- 1A SI Pump to A-AUTO
- A-A Aux Air Compressor to AUTO
[Aux Bldg, 734' elev, Refuel Floor]
- 2A CCP to A-AUTO
- 2A SI Pump to A-AUTO

26. **EVALUATE** isolation of non-essential Train A CCS heat loads **USING** App. E, CCS Heat Load Reduction.

27. **OPERATE** ERCW Pumps as necessary to perform the following:

- **CONTROL** pressure between 78 psig and 124 psig.
- **MAINTAIN** support of system loads.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.7 ERCW Supply Header 1A/2A Failure in Yard Area (cont'd)

28. **REFER TO** Appendix P, Potential Tech Spec Impacts.

29. **ENSURE** all breakers reopened
USING the following appendixes:

- Appendix F, ERCW Rx MOV Board
Appendix R ERCW Valves
- Appendix G, ERCW MCC Appendix R
Valves

30. **GO TO** appropriate plant procedure.



END OF SECTION

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.8 ERCW Supply Header 1B/2B Failure in Yard Area

CAUTION: During operation, CCP and SI Pumps may experience bearing failure 10 minutes after loss of ERCW cooling.

NOTE: Engineering may be able to identify ruptured yard header using yard piping drawings (17W300 series).

1. **DISPATCH** personnel to locate failure.

2. **DISPATCH** operators with radios to perform the following appendixes:
 - Appendix F, Rx MOV Board ERCW Valves. [Aux Bldg, el. 749', Rx MOV Boards]
 - Appendix G, ERCW MCC Valves [ERCW Pumping Stations]

3. **MONITOR** ERCW header pressure:
 - **CONTROL** Train B ERCW Pumps as required to maintain pressure between 78 psig and 124 psig.

4. **OPEN** alternate ERCW supply to DG HX:
 - 1-FCV-67-65 (1B DG)
 - 2-FCV-67-65 (2B DG)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2.8 ERCW Supply Header 1B/2B Failure in Yard Area (cont'd)		
5.	ENSURE 1A-A and 2A-A CCPs RUNNING.	
6.	STOP and LOCK OUT affected equipment: <ul style="list-style-type: none"> a. PLACE the following pumps in PULL TO LOCK: <ul style="list-style-type: none"> • 1B-B CCP • 1B-B SI Pump • 2B-B CCP • 2B-B SI Pump b. DISPATCH operator to place Train B Aux Air Compressor in SAFE STOP. [Aux Bldg, 734' elev, Refuel Floor] 	
7.	ISOLATE 1B/2B ERCW Crosstie Header: <ul style="list-style-type: none"> • CLOSE 1-FCV-67-24, ERCW Strainer 1B-B Isol Valve [Rx MOV Bd 1B2-B Compt. 3A]. • CLOSE 2-FCV-67-24, ERCW Strainer 2B-B Isol Valve [Rx MOV Bd 2B2-B Compt. 3A]. 	
8.	DO NOT CONTINUE UNTIL crosstie header is isolated.	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.8 ERCW Supply Header 1B/2B Failure in Yard Area (cont'd)

NOTE Number of pumps in service should be considered when evaluating header flows and pressures to determine if rupture is isolated.

9. DETERMINE if rupture is isolated:

a. **CHECK** 1B and 2B ERCW supply header parameters **NORMAL**:

- 1,2-FI-67-62
- 1,2-PI-67-488A

b. **EVALUATE** flood damage at CCW Bldg (IPS).

c. **GO TO** appropriate Plant Procedure.

a. **GO TO** Notes prior to step 10.



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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.8 ERCW Supply Header 1B/2B Failure in Yard Area (cont'd)

NOTES

- B train ERCW header failure in the yard area could result in all B train header pressures and flows indicating low.
- After the crosstie header valves at the IPS have been isolated the HIGH DIFF PRESSURE alarm may indicate the failed header.

10. **CHECK** Strainer Differential Pressure High Alarms on 0-XA-55-27A are dark:

- HEADER 1B-B STRAINER DIFF PRESS HIGH (window D-5)
- HEADER 2B-B STRAINER DIFF PRESS HIGH (window C-6)

IF window D-5 and C-6 are both illuminated,
THEN
GO TO Step 11.



IF window D-5 is illuminated,
THEN

a. **ISOLATE** 1B ERCW header rupture

- **CLOSE** 1-FCV-67-489, Hdr 1B Isol Before Strainer [ERCW MCC 1B-B Compt. 3C].
- **CLOSE** 1-FCV-67-82 AB Hdr 1B Isol [Rx MOV Bd 1B2-B Compt. 6C]

b. **GO TO** Note prior to Step 13.



IF window C-6 is illuminated,
THEN

a. **ISOLATE** 2B ERCW header rupture

- **CLOSE** 2-FCV-67-489 Hdr 2B Isol Before Strainer [ERCW MCC 2BB Compt. 3C].
- **CLOSE** 2-FCV-67-82 AB Hdr 2B Isol [Rx MOV Bd 2B2-B Compt. 6C]

b. **GO TO** Note prior to Step 12.



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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.8 ERCW Supply Header 1B/2B Failure in Yard Area (cont'd)

11. ISOLATE 1B ERCW Header rupture:

- a. **CLOSE** 1-FCV-67-489, Hdr 1B Isol Before Strainer. [ERCW MCC 1B-B Compt. 3C]
- b. **CLOSE** 1-FCV-67-82, AB header 1B Isolation Valve to Aux Bldg [Rx MOV Bd 2A2-A Compt. 3C]
- c. **GO TO** the Note before step 13.



NOTE Number of pumps in service should be considered when evaluating header flows and pressures to determine if rupture is isolated.

12. DETERMINE if Rupture is ISOLATED:

- a. **CHECK** 1B ERCW header parameters at expected values:

- 1-FI-67-62
- 1-PI-67-488A

- a. **RESTORE** 2B ERCW Header:

- **OPEN** 2-FCV-67-489, 2B ERCW header Isolation before strainer [ERCW MCC 1B-B Compt. 3C]
- **OPEN** 2-FCV-67-82 AB Hdr 2B Isol [Rx MOV Bd 2B2-B Compt. 6C]

GO TO Step 11 to isolate 1B header.



- b. **GO TO** the Note before step 16.



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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.8 ERCW Supply Header 1B/2B Failure in Yard Area (cont'd)

NOTE Number of pumps in service should be considered when evaluating header flows and pressures to determine if rupture is isolated.

13. **CHECK** 2B ERCW header parameters to determine if rupture is isolated:

- 2-FI-67-61
- 2-PI-67-493A

a. **RESTORE** 1B ERCW Header:

- **OPEN** 1-FCV-67-489, Hdr 1B Isol Before Strainer
[ERCW MCC 1B-B Compt. 3C]
- **OPEN** 1-FCV-67-82, Hdr 1B Isolation Valve to Aux Bldg
[Rx MOV Bd 2A2-A Compt. 3C]

b. **ISOLATE** 2B ERCW header:

- **CLOSE** 2-FCV-67-489 Hdr 2B Isol Before Strainer
[ERCW MCC 2BB Compt. 3C].
- **CLOSE** 2-FCV-67-82, Hdr 2B Isol valve to Aux Bldg.
[Rx MOV Bd. 2B2-B Compt. 3C]

c. **GO TO** Cautions prior to Step 16.



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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.8 ERCW Supply Header 1B/2B Failure in Yard Area (cont'd)

CAUTION Crosstying 2A and 1B train ERCW supply headers should only be performed if cooling is urgently required for Unit 1 Train B CCS related equipment. LCO 3.0.3 may be applicable.

14. EVALUATE aligning ERCW Hdr 2A to supply 1B loads:

- a. **CHECK** additional cooling needed for 1B train equipment:
- a. **GO TO** the note before step 19.



- b. **EVALUATE** crosstying 2A and 1B ERCW supply headers as follows:

- 1) **OPEN** 1-FCV-67-424
[Rx MOV Bd 1A2-A Compt. 9B]
and
RECORD Time _____
- 2) **ENSURE** 1-FCV-67-223, Hdr 1B to Hdr 2A OPEN. [Rx MOV Bd 1A2-A Compt. 8B]
- 3) **ENSURE** 2-FCV-67-223, Hdr 2A to Hdr 1B OPEN. [Rx MOV Bd 2A2-A Compt. 8B]

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.8 ERCW Supply Header 1B/2B Failure in Yard Area (cont'd)

15. **CHECK** 2A ERCW header pressure and flow NORMAL:

a. **CHECK** the following:

- 2-FI-67-61, at expected value
- 2-PI-67-493A, between 78 psig and 124 psig

a. **START** additional "A" Train ERCW pumps as necessary.

ISOLATE non-essential ERCW loads as necessary.

DO NOT CONTINUE UNTIL header pressure and flow are **ACCEPTABLE** for the current alignment.

b. **GO TO** Step 18.



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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.8 ERCW Supply Header 1B/2B Failure in Yard Area (cont'd)

CAUTION 1 Crosstying 1A and 2B train ERCW supply headers should only be performed if cooling is urgently required for Unit 2 Train B CCS related equipment. LCO 3.0.3 may be applicable.

CAUTION 2 Opening of crosstie valve 1-FCV-67-147 may result in severe fouling or flow blockage of 1A1/1A2 CCS Heat Exchanger, therefore, the CCS Hx 1A2 should be isolated prior to opening. After approximately 10 minutes 1A2 CCS Hx will be returned to service.

NOTE 1A ERCW header will supply 0B1 and 0B2 CCS heat exchangers if 1A and 2B ERCW headers are crosstied.

16. **DETERMINE** if ERCW Hdr 1A should be aligned to supply Hdr 2B loads:

a. **CHECK** if restoration of 2B ERCW header from Train A supply is required.

a. **GO TO** Step 19.



b. **ENSURE** 2-FCV-67-147, Hdr 2B to Hdr 1A OPEN. [Rx MOV Bd 2B2-B Compt. 3B]

c. **CLOSE** 0-67-1501 CCS Hx 1A2 Inlet Isolation Vlv.

d. **WHEN** 0-67-1501 CLOSED,
THEN
OPEN 1-FCV-67-147 [Rx MOV Bd 1A2-A Compt. 9A] and
RECORD Time _____

e. **WHEN** 1-FCV-67-147 has been OPEN for approximately 10 minutes,
THEN
OPEN 0-67-1501 CCS Hx 1A2 Inlet Isolation Vlv.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2.8 ERCW Supply Header 1B/2B Failure in Yard Area (cont'd)		
17.	CHECK 1A ERCW header pressures and flows NORMAL : <ul style="list-style-type: none"> • 1-FI-67-61, at expected value • 1-PI-67-493A, between 78 psig and 124 psig 	<p>START additional "A" Train ERCW pumps as necessary</p> <p>ISOLATE non-essential ERCW loads as necessary.</p> <p>DO NOT CONTINUE UNTIL header pressure and flow is acceptable for the current alignment.</p>
<p>NOTE 2A ERCW header may have been aligned to supply 1B ERCW header in step 14. 1A ERCW header may have been aligned to supply 2B ERCW header in step 16.</p>		
18.	IF any ERCW headers were crosstied, THEN RESTORE the applicable equipment as desired: <ul style="list-style-type: none"> • 1B CCP to A-AUTO • 1B SI Pump to A-AUTO • 2B CCP to A-AUTO • 2B SI Pump to A-AUTO • Train B Aux Air Compressor to AUTO [Aux Bldg, 734' elev, Refuel Floor] 	
19.	EVALUATE isolation of non-essential Train A CCS heat loads USING Appendix E, CCS Heat Load Reduction.	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.8 ERCW Supply Header 1B/2B Failure in Yard Area (cont'd)

20. **OPERATE** ERCW Pumps as necessary to maintain pressure between 78 psig and 124 psig.
21. **ENSURE** all breakers reopened **USING** the following:
 - Appendix F, ERCW Rx MOV Board ERCW Valves
 - Appendix G, ERCW MCC Valves
22. **REFER TO** the following:
 - Appendix A, Affected Equipment List (Header 1A)
 - Appendix C, Affected Equipment List (Header 2A)
 - Appendix P, Potential Tech Spec Impacts
23. **REFER TO** AOP-M.03, Loss of Component Cooling Water.
24. **GO TO** appropriate plant procedure.



END OF SECTION

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.9 ERCW Supply Header A Failure Upstream of ERCW Strainer Inlet Valves

CAUTION: During operation, CCP and SI Pumps may experience bearing failure 10 minutes after loss of ERCW.

1. **STOP** and **LOCK OUT** all Train A ERCW Pumps.

2. **DISPATCH** operators with radios to perform the following:
 - **PERFORM** Appendix F, Rx MOV Board ERCW Valves
[Aux Bldg el. 749', Rx MOV Boards]
 - **PERFORM** Appendix G, ERCW MCC Valves [ERCW Pumping Station]
 - **ENSURE** all pumping station watertight doors are CLOSED
[ERCW Pumping Station]

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.9 ERCW Supply Header A Failure Upstream of ERCW Strainer Inlet Valves (cont'd)

CAUTION: Loss of 2A ERCW Supply Header affects both Units' Train A CCS Heat Exchangers. Restoration of ERCW to intact CCS Heat Exchangers is time critical to prevent tripping both Units.

3. **MONITOR** the following on both units:

- REACTOR COOLANT PUMPS
MOTOR THRUST BEARING TEMP
HIGH alarm DARK [M-5B window E-3].

IF Thrust Bearing temp exceeds 200° F,
THEN
PERFORM the following:

- TRIP** the affected Unit(s) Rx.
- STOP** affected Unit(s) RCPs.
- IF** in Mode 1, 2, or 3,
THEN
GO TO E-0, Reactor Trip or Safety Injection, **WHILE** continuing with this procedure. [C.2]



IF in Mode 4, 5, or 6,
THEN
STABILIZE RCS temperature
USING RHR shutdown cooling.

4. **ENSURE** 1B-B and 2B-B CCPs RUNNING.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.9 ERCW Supply Header A Failure Upstream of ERCW Strainer Inlet Valves (cont'd)

5. **STOP** and **LOCK OUT** affected equipment:

a. **PLACE** the following pumps in PULL TO LOCK:

- 1A-A CCP
- 1A-A SI Pump
- 2A-A CCP
- 2A-A SI Pump

b. **DISPATCH** operator to place Train A Aux Air Compressor in SAFE STOP.
[Aux Bldg, 734' elev, Refuel Floor]

6. **OPEN** alternate ERCW supply to DGs to ensure cooling water is available:

- 1-FCV-67-68 (1A DG)
- 2-FCV-67-68 (2A DG)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.9 ERCW Supply Header A Failure Upstream of ERCW Strainer Inlet Valves (cont'd)

NOTE Flooding at the ERCW station may prevent FCVs from closing. Manual valves are located south of the CCW station and are normally locked open.

7. **ISOLATE** Train A ERCW Header rupture:

- | | |
|--|---|
| a. CLOSE 1-FCV-67-492, Header 1A Isol Before Strainer [ERCW MCC 1AA Compt. 3C] | a. CLOSE 1-VLV-67-518A, ERCW Supply Isolation Valve. |
| b. CLOSE 2-FCV-67-492, Header 2A Isol Before Strainer. [ERCW MCC 2AA Compt. 3C] | b. CLOSE 2-VLV-67-518A, ERCW Supply Isolation Valve. |

8. **OPERATE** available Train B ERCW Pumps as necessary to perform the following:

- **CONTROL** pressure between 78 psig and 124 psig.
- **MAINTAIN** support of system loads.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.9 ERCW Supply Header A Failure Upstream of ERCW Strainer Inlet Valves (cont'd)

CAUTION 1 Loss of 2A ERCW Supply Header affects both Units' Train A CCS Heat Exchangers. Restoration of ERCW to intact CCS Heat Exchangers is time critical to prevent tripping both Units.

CAUTION 2 Opening crosstie valve 1-FCV-67-424 may result in fouling or blockage of CCS HX. If time permits, CCS Hx 1A2 and 2A2 should be isolated prior to opening. After approx. 10 minutes, 1A2 CCS Hx will be returned to service.

- NOTES:**
- Crosstying ERCW headers 1B and 2A in following step allows time for orderly shutdown by ensuring CCS cooling for RCPs. LCO 3.0.3 may be applicable.
 - With the ERCW header crosstie valves at the CCW (IPS) station open, 1B header will supply 2A and 1A ERCW Aux Bldg supply headers. Additional Train B ERCW pumps may have to be started.

9. **ALIGN** ERCW header 1B to supply 2A:

- a. **IF** desired to isolate 1A2 and 2A2 CCS Hx prior to opening crosstie valve,
THEN

PERFORM the following:

- 1) **CLOSE** the following CCS Hx Inlet valves:

- 1-67-1501 CCS Hx 1A2
- 2-67-1501 CCS Hx 2A2

- 2) **WHEN** CCS Inlet valves **CLOSED**,
THEN

OPEN 1-FCV-67-424

[Rx MOV Bd 1A2-A Compt. 9B]
and

RECORD Time _____

IF 1B ERCW header will **NOT** be aligned to supply 2A header,

THEN

PERFORM the following:

- a. **TRIP** BOTH Unit's Reactors.
- b. **STOP** both units RCPs.
- c. **IF** in Modes 1, 2, or 3,
THEN
GO TO E-0,
WHILE continuing in this procedure.



- d. **IF** in modes 4, 5, or 6,
THEN
STABILIZE RCS Temperature
USING RHR shutdown Cooling.
GO TO Step 15.



(Step Continued on next page)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.9 ERCW Supply Header A Failure Upstream of ERCW Strainer Inlet Valves (cont'd)

9. a. 3) **WHEN** 1-FCV-67-424 has been OPEN
for approximately 10 minutes,
THEN
OPEN CCS Inlet Valves:

- 1-67-1501 CCS Hx 1A2
- 2-67-1501 CCS Hx 2A2

- 4) **GO TO** Substep c.



- b. **OPEN** 1-FCV-67-424 [Rx MOV Bd 1A2-A
Compt. 9B]
and
RECORD Time _____
- c. **ENSURE** 1-FCV-67-223, Hdr 1B to Hdr 2A
OPEN. [Rx MOV Bd 1A2-A Compt. 8B]
- d. **ENSURE** 2-FCV-67-223, Hdr 2A to Hdr 1B
OPEN. [Rx MOV Bd 2A2-A Compt. 8B]

10. **EVALUATE** if 2B header should be crosstied
with 1A header:

- a. **CHECK** if additional flow for 1A header
is required from 2B header:

- a. **GO TO** step 11.



- b. **OPEN** 1-FCV-67-147, Hdr 1A to
Hdr 2B Isol Valve
[Rx MOV Bd 1A2-A Compt. 9A] and
RECORD the time. _____
- c. **ENSURE** 2-FCV-67-147, Hdr 2B to
Hdr 1A Isol Valve is OPEN.
[Rx MOV Bd 2B2-B Compt. 3B].

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.9 ERCW Supply Header A Failure Upstream of ERCW Strainer Inlet Valves (cont'd)

11. **START** additional Lower Compartment Cooling Fans and CRDM Fans as required to maintain containment temperature.

12. **MONITOR** Containment Pressure and Temperature.

13. **CHECK** 1B and 2B ERCW header flows and pressures NORMAL:

- 1-FI-67-62
- 2-FI-67-62
- 1-PI-67-488A
- 2-PI-67-488A

START additional "B" Train ERCW pumps as necessary.

ISOLATE non-essential ERCW loads as necessary.

DO NOT CONTINUE UNTIL header pressure and flow are adequate for current alignment.

14. **RESTORE** equipment:

a. **CHECK** Train A ERCW header supplied from Train B crosstie.

a. **GO TO** step 16.



b. **RESTORE** the following handswitches as applicable:

- 1A-A CCP to A-AUTO
- 1A-A SI Pump to A-AUTO
- Train A Aux Air Compressor to AUTO [Aux Bldg, 734' elev, Refuel Floor]
- 2A-A CCP to A-AUTO
- 2A-A SI Pump to A-AUTO

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.9 ERCW Supply Header A Failure Upstream of ERCW Strainer Inlet Valves (cont'd)

15. **EVALUATE** isolation of non-essential
Train A CCS heat loads
USING Appendix E, CCS Heat Load
Reduction.

16. **ENSURE** all breakers open
USING the following appendixes:

- Appendix F, ERCW Rx MOV Board
Valves
- Appendix G, ERCW MCC Valves

17. **REFER** to the following appendixes:

- Appendix A, Affected Equipment List
(Header 1A)
- Appendix C, Affected Equipment List
(Header 2A)
- Appendix P, Potential Tech Spec
Impacts.

18. **REFER TO** AOP-M.03, Loss of
Component Cooling Water

19. **GO TO** appropriate plant procedure.



END OF SECTION

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.10 ERCW Supply Header B Failure Upstream of ERCW Strainer Inlet Valves

CAUTION: During operation, CCP and SI Pumps may experience bearing failure 10 minutes after loss of ERCW cooling.

1. **STOP** and **LOCK OUT** all Train B ERCW Pumps.
2. **DISPATCH** operators with radios to perform the following:
 - **PERFORM** Appendix F, Rx MOV Board ERCW Valves [Aux Bldg el. 749', Rx MOV Boards].
 - **PERFORM** Appendix G, ERCW MCC Valves. [ERCW Pumping Stations]
 - **ENSURE** all pumping station watertight doors are CLOSED. [ERCW Pumping Station].
3. **ENSURE** 1A-A and 2A-A CCPs RUNNING.
4. **STOP** and **LOCK OUT** affected equipment:
 - a. **PLACE** the following pumps in PULL TO LOCK:
 - 1B-B CCP
 - 1B-B SI Pump
 - 2B-B CCP
 - 2B-B SI Pump
 - b. **DISPATCH** operator to place Train B Aux Air Compressor in SAFE STOP. [Aux Bldg, 734' elev, Refuel Floor]

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.10 ERCW Supply Header B Failure Upstream of ERCW Strainer Inlet Valves (cont'd)

5. **OPEN** alternate ERCW supply to Train B DGs

- 1-FCV-67-65 (1B DG)
- 2-FCV-67-65 (2B DG)

NOTE Flooding at the ERCW station may prevent FCVs from closing. Manual valves are located south of the CCW station and are normally locked open.

6. **ISOLATE** Train B ERCW Header rupture:

- | | |
|---|--|
| a. CLOSE 1-FCV-67-489, Header 1B Isol Before Strainer [ERCW MCC 1B-B Compt. 3C]. | a. CLOSE 1-VLV-67-518B, ERCW Supply Isolation Valve |
| b. CLOSE 2-FCV-67-489, Header 2B Isol Before Strainer [ERCW MCC 2B-B Compt. 3C]. | b. CLOSE 2-VLV-67-518B, ERCW Supply Isolation Valve |

7. **OPERATE** available Train A ERCW Pumps to maintain pressure between 78 psig and 124 psig.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.10 ERCW Supply Header B Failure Upstream of ERCW Strainer Inlet Valves (cont'd)

CAUTION 1 Crosstying A and B train ERCW supply headers should only be performed if cooling is urgently required for Train B CCS related equipment. LCO 3.0.3 may be applicable.

CAUTION 2 Opening of crosstie valve 1-FCV-67-147 may result in severe fouling or flow blockage of 0B1/0B2 CCS Heat Exchanger, therefore the CCS Hx 0B2 should be isolated prior to opening. After approximately 10 minutes 0B2 CCS Hx will be returned to service.

- NOTE**
- The following step allows 1A ERCW header to supply 2B ERCW header (including 0B1 and 0B2 CCS HX).
 - With the ERCW header crosstie valves at the CCW (IPS) station open, 1A header will supply 2B and 1B ERCW Aux Bldg supply headers.

8. **EVALUATE** aligning Train A ERCW to supply Train B:

a. **IF** aligning 1A to 2B header is desired,
THEN
PERFORM the following:

- 1) **DISPATCH** personnel to CLOSE
0-67-1501 CCS Hx OB2 Inlet valve.
- 2) **WHEN** 0-67-1501 CLOSED,
THEN
OPEN 1-FCV-67-147, Hdr 1A to
Hdr 2B Isol Valve
[Rx MOV Bd 1A2-A Compt. 9A] and
RECORD time _____
- 3) **WHEN** 1-FCV-67-147 has been OPEN
for approximately 10 minutes,
THEN
OPEN 0-67-1501 CCS Hx OB2 Inlet
valve

(step continued on next page)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.10 ERCW Supply Header B Failure Upstream of ERCW Strainer Inlet Valves (cont'd)

8. b. **IF** aligning 2A to 1B header is desired,
THEN
PERFORM the following:
 - **OPEN** 1-FCV-67-424, Hdr 1B to
Hdr 2A CCS HX Isol Valve
[Rx MOV Bd 1A2-A Compt. 9B] and
RECORD the Time _____
 - **ENSURE** 1-FCV-67-223, Hdr 1B
to Hdr 2A Isol Valve is OPEN.
[Rx MOV Bd 1A2-A Compt. 8B].
 - **ENSURE** 2-FCV-67-223, Hdr 2A
to Hdr 1B Isol Valve is OPEN.
[Rx MOV Bd 2A2-A Compt. 8B].
9. **START** additional Lower Compartment
Cooling Fans and CRDM Fans
as required to maintain containment
temperature.
10. **MONITOR** Containment Pressure and
Temperature.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.10 ERCW Supply Header B Failure Upstream of ERCW Strainer Inlet Valves (cont'd)

11. **CHECK** 1A and 2A ERCW header pressures and flows adequate for current alignment:

- 1-FI-67-61 and 2-FI-67-61, at expected value
- 1-PI-67-493A and 2-PI-67-493A

START additional "A" Train ERCW pumps as necessary.

ISOLATE non-essential ERCW loads as necessary.

DO NOT CONTINUE UNTIL header pressure and flow are adequate for current alignment.

12. **RESTORE** equipment:

a. **CHECK** Train B ERCW header supplied from Train A crosstie.

a. **GO TO** step 14.



b. **RESTORE** the following handswitches as applicable:

- 1B-B CCP to A-AUTO
- 1B-B SI Pump to A-AUTO
- 2B-B CCP to A-AUTO
- 2B-B SI Pump to A-AUTO
- Train B Aux Air Compressor to AUTO [Aux Bldg, 734' elev, Refuel Floor]

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.10 ERCW Supply Header B Failure Upstream of ERCW Strainer Inlet Valves (cont'd)

13. **EVALUATE** isolation of non-essential Train A CCS heat loads
USING Appendix E, CCS Heat Load Reduction.

14. **ENSURE** all breakers opened
USING the following appendixes
 - Appendix F, Rx MOV Board ERCW Valves
 - Appendix G, ERCW MCC Valves

15. **REFER TO** the following:
 - Appendix B, Affected Equipment List (Header 1B)
 - Appendix D, Affected Equipment List (Header 2B)
 - Appendix P, Potential Tech Spec Impacts.

16. **REFER TO** AOP-M.03, Loss of Component Cooling Water.

17. **GO TO** appropriate plant procedure.



END OF SECTION

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.11 Loss of all ERCW flow [C.3]

NOTES

- EOPs are not applicable if BOTH trains of ERCW are lost unless specifically directed by this section.
- This section takes priority over all other AOPs. Other AOPs should NOT be performed concurrently except for AOP-T.01 (Security Events).

1. **ENSURE** reactor TRIPPED: [M-4]

- Reactor trip breakers OPEN
- Reactor trip bypass breakers OPEN or DISCONNECTED
- Neutron flux DROPPING
- Rod bottom lights LIT
- Rod position indicators less than or equal to 12 steps.

IF reactor CANNOT be tripped from MCR,
THEN
DISPATCH operator to perform one of the following:

- **OPEN** reactor trip breakers and MG set output breakers locally. [AB el. 759 MG Set Room]

OR

- **OPEN** MG set breakers at 480V Unit Boards. [TB el. 685 and 706]

2. **ENSURE** turbine TRIPPED:

- Turbine stop valves CLOSED.

IF turbine CANNOT be tripped,
THEN
ENSURE MSIV and MSIV bypass valve handswitches in CLOSE position.

3. **PLACE** the following equipment in STOP/PULL TO LOCK:

- CCPs
- Reactor Coolant Pumps

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.11 Loss of all ERCW flow (cont'd)

4. **DEPRESS** EMERGENCY STOP pushbuttons for all diesel generators.

5. **MONITOR** at least one shutdown board energized from start bus.

ATTEMPT to restore power to one shutdown board from start bus.

IF power CANNOT be immediately restored to at least one shutdown board,
THEN
GO TO ECA-0.0, Loss of all AC Power.



6. **PLACE** the following equipment switches in PULL TO LOCK:

- ERCW pumps
- RHR pumps
- SI pumps
- Containment spray pumps

7. **NOTIFY** SM and STA to evaluate the following:

- EPIP-1, Emergency Plan Classification Matrix
- Tech Spec LCO 3.0.3, 3.7.4, and 3.8.1.1

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.11 Loss of all ERCW flow (cont'd)


CAUTION 1 Temporary cooling water supply from HPFP to one CCP should be established as soon as possible.

CAUTION 2 CCS for the unit NOT supplying SFP cooling will have a faster heatup rate. Therefore, establishing temporary cooling to a CCP on the unit NOT supplying the SFP is more time critical.

8. **INITIATE** temporary cooling to one CCP and Station Air compressors:

- a. **DETERMINE** which CCP to install temporary cooling water supply.
- b. **DISPATCH** operators to **PERFORM** Appendix I, Temporary Cooling to CCP Oil Coolers.
- c. **DISPATCH** operator to **PLACE** Air Compressors in SAFE-STOP:
 - Station Air Compressors
 - Aux Air Compressors
- d. **DISPATCH** operator and Mechanical Maintenance to perform Appendix J, Temporary Cooling to Station Air Compressors.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2.11 Loss of all ERCW flow (cont'd)		
NOTE 1	Appendix O contains two copies of handout pages identifying continuous action steps.	
NOTE 2	TD AFW Level Control Valves fail open on loss of air. LCVs may be operated from main control room until essential air is lost.	
9.	MONITOR RCS temperature:	
a.	IF T-cold is less than 547°F and dropping, THEN PERFORM the following:	
	1) ENSURE atmospheric relief valves and steam dumps CLOSED .	
	2) CHECK TD AFW pump RUNNING	2) GO TO Step 10.
		
	3) STOP and PULL-TO-LOCK MD AFW pumps.	
	4) CONTROL AFW flow to between 440 and 600 gpm: <ul style="list-style-type: none"> • ADJUST TD AFW speed USING EA-3-1. • OPERATE TD AFW LCVs as necessary (if essential air available). 	4) IF TD AFW flow CANNOT be adjusted, THEN DISPATCH AUO(s) to perform EA-3-4, Local Alignment of TD AFW LCV Backup Air Supply.
	5) MAINTAIN total feed flow greater than 440 gpm UNTIL narrow range level is greater than 10% [25% ADV] in at least one S/G.	
b.	IF T-cold is greater than 552°F and rising, THEN DISPATCH operator to locally operate S/G # 1 and 4 atmospheric relief valves USING EA-1-2.	


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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.11 Loss of all ERCW flow (cont'd)

NOTE The backup high pressure air bottles can provide four operations of each TD AFW LCV after essential control air is lost.

10. **MONITOR** AFW pump status:

- | | |
|--|--|
| <p>a. ENSURE TDAFW pump RUNNING.</p> | <p>a. ENSURE MD AFW pumps supplying AFW by performing the following:</p> <ol style="list-style-type: none"> 1) ENSURE at least one MD AFW pump RUNNING. 2) DISPATCH operator to locally control MDAFW flow USING Appendix K. 3) MAINTAIN total feed flow greater than 440 gpm UNTIL narrow range level is greater than 10% [25% ADV] in at least one S/G. 4) GO TO Step 11. |
|--|--|
-
- 
- | | |
|--|--|
| <p>b. CONTROL TD AFW flow USING EA-3-1, MCR Operation of TD AFW Pump.</p> <p>c. DISPATCH AUO(s) to perform EA-3-4, Local Alignment of TD AFW LCV Backup Air Supply.</p> <p>d. WHEN backup air supply is depleted, THEN DISPATCH AUO(s) to locally operate TDAFW LCVs USING Appendix L, Local Control of Turbine Driven AFW LCVs.</p> <p>e. ENSURE MD AFW pumps STOPPED.</p> <p>f. MAINTAIN AFW flow greater than 440 gpm UNTIL narrow range level greater than 10% [25% ADV] in at least one S/G</p> | |
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.11 Loss of all ERCW flow (cont'd)

11. **CONTROL** S/G narrow range levels between 10% [25% ADV] and 50%:

- **CONTROL** TD AFW pump speed (if running).
- **CONTROL** AFW LCVs.

IF S/G level is greater than 50%,
THEN
STOP AFW pumps as necessary.

12. **ENSURE** Steamlines and Main Feedwater ISOLATED:

- ENSURE** MSIV handswitches in CLOSE position.
- ENSURE** MSIV bypass valves CLOSED.
- ENSURE** MFW Isolation Valves CLOSED.
- ENSURE** Blowdown Isolation Valves CLOSED.

NOTE FRPs are not applicable. Shift Manager and TSC should be notified of any red or orange path conditions.

13. **MONITOR** FR-0 status trees for information only.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.11 Loss of all ERCW flow (cont'd)

14. CHECK RCS ISOLATED:

- | | |
|--|---|
| <p>a. ENSURE Pressurizer PORVs CLOSED.</p> | <p>a. IF pressurizer pressure less than 2335 psig,
THEN
CLOSE pressurizer PORVs.</p> |
| <p>b. ENSURE Normal Letdown Valves CLOSED:</p> <ul style="list-style-type: none"> • FCV-62-69 • FCV-62-70 • FCV-62-72 • FCV-62-73 • FCV-62-74 | |
| <p>c. ENSURE Excess letdown isolation valves CLOSED:</p> <ul style="list-style-type: none"> • FCV-62-54 • FCV-62-55 | |
| <p>d. VERIFY RCS and Pressurizer sample valves CLOSED:
[status panels 6K and 6L]</p> <ul style="list-style-type: none"> • FCV-43-3 or FCV-43-2 • FCV-43-12 or FCV-43-11 • FCV-43-23 or FCV-43-22 | <p>d. NOTIFY Chem Lab to CLOSE valves.</p> |

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2.11 Loss of all ERCW flow (cont'd)		
15.	MAINTAIN RCS T-cold between 540°F and 552°F USING Local Control of S/G #1 and 4 atmospheric relief valves: <ul style="list-style-type: none"> • DISPATCH personnel with radio to perform EA-1-2, Local Control of S/G PORVs. 	
16.	ISOLATE CST from hotwell to conserve CST water for AFW use: <ul style="list-style-type: none"> a. PLACE auto makeup to hotwell from CST controller LIC-2-9 in MANUAL and CLOSE makeup valve. b. PLACE hotwell pump discharge to CST dumpback controller LIC-2-3 in MANUAL and CLOSE dumpback valve. c. MONITOR hotwell level stable or dropping. c. DISPATCH operator to locally isolate CST from hotwell USING EA-2-1, Condenser Makeup Isolation. d. ESTABLISH CST makeup as required. 	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.11 Loss of all ERCW flow (cont'd)

17. **MONITOR** containment vacuum relief normal:

a. **CHECK** containment pressure less than 1.0 psig.

a. **GO TO** Step 18.



b. **VERIFY** containment vacuum relief isolation valves OPEN: [Panel 6K]

b. **OPEN** valves [M-9]


- FCV-30-46 OPEN
- FCV-30-47 OPEN
- FCV-30-48 OPEN.

18. **START** one containment air return fan.

19. **ALIGN** CCP suction to RWST:

- a. **ENSURE** RWST Suction Valves LCV-62-135 AND LCV-62-136 OPEN.
- b. **ENSURE** VCT Outlet Valves LCV-62-132 OR LCV-62-133 CLOSED.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2.11 Loss of all ERCW flow (cont'd)		
CAUTION	Restoring seal injection to hot RCP seals following loss of all seal cooling could result in thermal shock to RCP seals. If all seal cooling has been lost, RCP seals should be isolated PRIOR TO restarting a CCP.	
NOTE 1	CCS heatup rate will be slower for unit supplying Spent Fuel Pit cooling.	
NOTE 2	If RCP seal injection and thermal barrier flowpaths are isolated, subsequent cooldown of RCP seals will be accomplished later by RCS cooldown.	
20. MONITOR	RCP seal cooling available:	
a.	CHECK Train A CCS Outlet temperature less than 130°F. [TR-70-161]	a. ISOLATE Thermal Barrier Cooling by performing the following: <ol style="list-style-type: none"> STOP Thermal Barrier Booster Pumps on affected Unit AND PLACE in PULL-TO-LOCK. CLOSE Thermal Barrier Valves: <ul style="list-style-type: none"> FCV-70-133 or 134 FCV-70-87 or 90 STOP CCS pumps A-A and B-B on affected Unit and PLACE in PULL-TO-LOCK. STOP CCS pump C-S and PLACE in PULL-TO-LOCK. GO TO Substep 20.b. 
(step continued on next page)		

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.11 Loss of all ERCW flow (cont'd)

20. b. **CHECK** RCP seal cooling flow in service:

- CCP running and supplying RCP Seal Injection flow

OR

- Thermal barrier cooling in service.

b. **IF** Thermal barrier Cooling **AND** RCP seal injection flow are lost, **THEN** **PERFORM** the following:

- 1) **DISPATCH** operator to locally isolate RCP seals by performing Appendix N, Local Isolation of RCP Seal Injection.
- 2) **CLOSE** FCV-62-61 or FCV-62-63. [M-5]

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.11 Loss of all ERCW flow (cont'd)

CAUTION If thermal barrier cooling is NOT in service, restarting CCP prior to locally isolating seal injection flowpath (Appendix N) could result in thermal shock to seal package.

21. MONITOR if CCP can be started:

- | | |
|---|--|
| <p>a. CHECK temporary cooling water supply to CCP oil coolers established.</p> | <p>a. WHEN temporary cooling water is established to CCP,
THEN
PERFORM Substeps 21.b through f.</p> |
|---|--|

GO TO Step 22.



- | | |
|--|---|
| <p>b. CHECK RCP Thermal Barrier Cooling in service.</p> | <p>b. WHEN seal injection flowpath is isolated (Appendix N),
THEN
PERFORM Substeps 21.c through f.</p> |
|--|---|



GO TO Step 22.



- c. **START** CCP supplied by temporary cooling water.
- d. **DISPATCH** operator to locally control charging flow **USING** VLV-62-535 or VLV-62-536 (B-B CCP room).
- e. **MONITOR** CCP bearing and motor winding temperatures.

(step continued on next page)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2.11 Loss of all ERCW flow (cont'd)		
21. f. CONTROL CCP flow:		
1) CHECK CCPIT valves CLOSED.		1) GO TO Step 22. 
2) CHECK seal injection flowpath available.		2) ESTABLISH Normal Charging flowpath: a) ENSURE FCV-62-90 AND FCV-62-91 OPEN. b) ADJUST charging flow USING FCV-62-93 (if control air available) or Local control to maintain Pressurizer level. c) GO TO Step 22. 
3) ENSURE FCV-62-90 and FCV-62-91 CLOSED.		
4) ADJUST seal injection flow to maintain between 6 and 13 gpm USING one of the following: • FCV-62-93 (if control air available) OR • local control (VLV-62-535 or VLV-62-536).		

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2.11 Loss of all ERCW flow (cont'd)		
22.	MONITOR pressurizer pressure:	
a.	Pressurizer pressure between 2210 and 2260 psig.	<p>a. IF pressure less than 2210 psig and dropping, THEN PERFORM the following:</p> <p>1) ENSURE pressurizer PORVs CLOSED.</p> <p>IF pressurizer PORV CANNOT be closed, THEN CLOSE associated block valve.</p> <p>2) IF SI signal is NOT actuated, THEN ENSURE all available pressurizer heaters ON.</p> <p>b. IF pressure greater than 2260 psig and rising, THEN PERFORM the following:</p> <p>1) ENSURE all pressurizer heaters OFF.</p> <p>2) ENSURE pressure controlled USING pressurizer PORV(s).</p>

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.11 Loss of all ERCW flow (cont'd)

23. **MAINTAIN** pressurizer level
between 20% [35% ADV] and 65%:

a. **CONTROL** charging flow to maintain
pressurizer level.

a. **IF** low pressurizer level is the result of
RCS cooldown,
THEN
STOP RCS cooldown.

IF NO CCP is running,
THEN
GO TO Step 24.



b. **OPERATE** Reactor Vessel Head Vents
as necessary to maintain pwr level
between 20% [35% ADV] and 65%:

1) **OPEN** head vent block valve
FSV-68-394 OR FSV-68-395.

2) **OPEN** head vent throttle valve
FSV-68-396 OR FSV-68-397.

3) **WHEN** desired Pwr level is achieved,
THEN
CLOSE Head Vent Valves.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2.11 Loss of all ERCW flow (cont'd)		
24.	<p>MONITOR if RCS cooldown should be started:</p> <p>a. CHECK Pressurizer level greater than 10% [20% ADV].</p> <p>a. IF pwr level CANNOT be maintained greater than 10% [20% ADV], THEN PERFORM the following:</p> <p>1) INITIATE SI signal.</p> <p>2) GO TO Step 25 to initiate RCS cooldown and depressurization.</p> <p>b. VERIFY Natural Circulation USING EA-68-6, Monitoring Natural Circulation Conditions.</p> <p>c. NOTIFY TSC (when staffed) to perform Appendix M, TSC Actions in event of loss of ERCW.</p> <p>d. DO NOT CONTINUE UNTIL CCP has been started.</p> <p>e. GO TO Step 39 to initiate plant cooldown.</p>	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.11 Loss of all ERCW flow (cont'd)

CAUTION Allowing RCS pressure to drop below 100 psig prior to isolating CLAs could result in nitrogen injection into the RCS.

NOTE Cooldown rate should be maintained as close to 100°F/hr as possible.

25. **DEPRESSURIZE** Intact S/Gs to reduce RCS pressure to less than 200 psig:

a. **MAINTAIN** at least one S/G narrow range level greater than 10% [25% ADV].

a. **PERFORM** the following:

- 1) **CONTROL** atmospheric reliefs to stop S/G depressurization.
- 2) **MAINTAIN** maximum AFW flow UNTIL level greater than 10% [25% ADV] in at least one S/G.
- 3) **WHEN** level greater than 10% [25% ADV] in at least one S/G, **THEN** **PERFORM** Substeps 25.b., 25.c. and 25.d.
- 4) **GO TO** Step 26.



b. **MAINTAIN** T-cold cooldown rate less than 100°F/hr.

c. **DUMP** steam from Intact S/Gs **USING** atmospheric reliefs.

c. **DUMP** steam from Intact S/Gs **USING** EA-1-2, Local Control of S/G PORVs.

d. **WHEN** RCS pressure between 100 psig and 200 psig, **THEN** **STOP** cooldown and **MAINTAIN** current plant conditions.


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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2.11 Loss of all ERCW flow (cont'd)		
26.	RESET SI signal after 60 second time delay.	
27.	VERIFY the following ESF actuations:	
a.	CCPIT valves aligned: <ul style="list-style-type: none"> FCV-63-25 and FCV-63-26 OPEN FCV-63-39 and FCV-63-40 OPEN FCV-62-90 and FCV-62-91 CLOSED. 	
b.	Containment Ventilation Isolation dampers CLOSED: <ul style="list-style-type: none"> Panel 6K CNTMT VENT GREEN Panel 6L CNTMT VENT GREEN. 	b. PERFORM the following: <ol style="list-style-type: none"> ACTUATE PHASE A AND CNTMT VENT ISOL. ENSURE dampers CLOSED. NOTIFY TSC to determine corrective action for dampers without power or indication.
c.	Phase A valves CLOSED: <ul style="list-style-type: none"> Panel 6K PHASE A GREEN Panel 6L PHASE A GREEN. 	c. PERFORM the following: <ol style="list-style-type: none"> ACTUATE PHASE A. ENSURE valves CLOSED. NOTIFY TSC to determine corrective action for dampers without power or indication.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2.11 Loss of all ERCW flow (cont'd)		
28. MONITOR Phase B status:		PERFORM the following:
<ul style="list-style-type: none"> Phase B NOT ACTUATED Containment pressure less than 2.81 psig. 		<ul style="list-style-type: none"> a. ENSURE PHASE B ACTUATED. b. ENSURE Phase B valves CLOSED: <ul style="list-style-type: none"> Panel 6K PHASE B GREEN Panel 6L PHASE B GREEN. c. RESET Containment Spray.
29. CHECK reactor SUBCRITICAL:		CONTROL atmospheric reliefs to stop S/G depressurization.
<ul style="list-style-type: none"> IRM startup rate zero or negative SRM startup rate zero or negative. 		ALLOW RCS to heat up.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2.11 Loss of all ERCW flow (cont'd)		
30.	CHECK whether cooldown should be stopped:	
a.	CHECK RCS pressure between 100 psig and 200 psig.	a. CONTINUE depressurization until RCS between 100 psig and 200 psig.
b.	STOP S/G depressurization.	
c.	ISOLATE CLAs:	
	1) DISPATCH personnel to restore power to CLA isolation valves USING EA-201-1, 480V Board Room Breaker Alignments.	
	2) CLOSE CLA isolation valves.	
	3) NOTIFY local personnel to remove power to CLA isolation valves USING EA-201-1, 480 V Board Room Breaker Alignments.	
31.	CHECK CCP in service.	NOTIFY TSC to EVALUATE operating one RHR pump to restore pressurizer level.
32.	CHECK Core Exit TCs less than 1200°F.	IF at least 5 core exit TCs greater than 1200°F AND rising, THEN GO TO SACRG-1, Severe Accident Control Room Guideline Initial Response
		

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.11 Loss of all ERCW flow (cont'd)

33. CHECK CCPIT flow NOT required:

IF criteria NOT met,
THEN
GO TO Step 29.

a. RCS subcooling based on core exit T/Cs greater than 40°F.



b. Secondary heat sink:

- Narrow range level in at least one S/G greater than 10% [25% ADV].

OR —

- Total feed flow to S/Gs greater than 440 gpm.

c. RCS pressure stable or rising.

d. Pressurizer level greater than 10% [20% ADV].

34. ENSURE CCPIT ISOLATED:

- **CLOSE** inlet isolation valves FCV-63-39 and FCV-63-40.
- **CLOSE** outlet isolation valves FCV-63-26 and FCV-63-25.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.11 Loss of all ERCW flow (cont'd)

35. **ESTABLISH** charging flow:

- a. **OPEN** charging flow isolation valves
FCV-62-90 and FCV-62-91.
- b. **CHECK** alternate or normal charging
isolation valve FCV-62-85 or
FCV-62-86 **OPEN**.
- c. **ADJUST** FCV-62-93 OR
locally control manual valves
(VLV-62-535 OR VLV-62-536)
as necessary to maintain pwr level.

36. **MONITOR** ECCS flow NOT required:

- Pressurizer level is maintained
greater than 10% [20% ADV]
- RCS subcooling based on core exit
T/Cs greater than 40°F.

IF ECCS flow is required,
THEN
PERFORM the following:

- 1) **OPEN** CCPIT valves:
 - FCV-63-25 AND FCV-63-26
 - FCV-63-39 AND FCV-63-40.
- 2) **CLOSE** charging valves:
 - FCV-62-90 AND FCV-62-91.
- 3) **GO TO** Step 29.



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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.11 Loss of all ERCW flow (cont'd)

37. **MAINTAIN** pressurizer level between 20% [35% ADV] and 65%:
- a. **CONTROL** charging flow to maintain pressurizer level.
 - b. **OPERATE** Reactor Vessel Head Vents as necessary to maintain pressurizer level between 20% [35% ADV] and 65%:
 - 1) **OPEN** head vent block valve FSV-68-394 OR FSV-62-395.
 - 2) **OPEN** head vent throttle valve FSV-68-396 OR FSV-68-397.
 - 3) **WHEN** desired Pzr level is achieved,
THEN
CLOSE Head Vent Valves.

38. **GO TO** Step 48.



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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2.11 Loss of all ERCW flow (cont'd)		
39.	EMERGENCY BORATE RCS to cold shutdown boron concentration USING EA-68-4, Emergency Boration.	
40.	INITIATE RCS cooldown to Mode 4:	
a.	MAINTAIN T-cold cooldown rate less than 50°F/hr.	
b.	DUMP steam USING atmospheric relief(s).	
c.	MAINTAIN S/G narrow range level between 10% [25% ADV] and 50%.	c. CONTROL feed flow as necessary.
d.	MAINTAIN RCS T-cold and pressure within limits USING Tech Spec temperature/pressure limit curves.	
41.	DEPRESSURIZE RCS to 1920 psig to permit SI block:	
a.	DEPRESSURIZE RCS to 1920 psig USING one pressurizer PORV.	
b.	BLOCK SI signals: <ul style="list-style-type: none"> • Low pressurizer pressure SI • Low steamline pressure SI. 	
c.	MAINTAIN RCS pressure less than 1920 psig.	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2.11 Loss of all ERCW flow (cont'd)		
42.	MONITOR RCS cooldown:	
	<ul style="list-style-type: none">• Core exit T/Cs DROPPING• T-hot DROPPING• RCS subcooling RISING (based on core exit T/Cs).	
43.	INITIATE RCS depressurization:	
	a. MAINTAIN RCS subcooling based on core exit-T/Cs greater than 140°F.	a. STOP RCS depressurization and ESTABLISH required subcooling.
	b. REFER TO ES-0.2 Curve 3 (Curve 4), Natural Circulation Cooldown NO CRDM Fans Running - 140°F Subcooling.	
	c. INITIATE RCS depressurization USING one pressurizer PORV.	
44.	CONTINUE RCS cooldown and depressurization:	
	a. MAINTAIN T-cold cooldown rate less than 50°F/hr.	
	b. MAINTAIN RCS subcooling based on core exit T/Cs greater than 140°F.	b. STOP RCS depressurization and ESTABLISH required subcooling.
	c. MAINTAIN RCS T-cold and pressure within limits USING Tech Spec temperature/pressure limit curves.	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.11 Loss of all ERCW flow (cont'd)

NOTE "Unexpected pressurizer level changes indicative of vessel voiding" is defined as an unexplained level rise when reducing RCS pressure OR an unexplained level drop when raising RCS pressure.

45. **MONITOR** for steam voids in reactor vessel:

a. **CHECK** for the following indications of steam voids:

- unexpected pressurizer level changes indicative of voiding

OR

- RVLIS upper plenum range less than 104%.

b. **REPRESSURIZE** RCS within limits of Tech Spec temperature/pressure limit curves to collapse voids in system and **CONTINUE** cooldown.

a. **GO TO** Step 46.



46. **WHEN** RCS pressure less than 1000 psig,
THEN
ISOLATE CLAs:

- DISPATCH** personnel to restore power to CLA isolation valves **USING** EA-201-1, 480V Board Room Breaker Alignments.
- CLOSE** CLA isolation valves.
- NOTIFY** local personnel to remove power to CLA isolation valves **USING** EA-201-1, 480 V Board Room Breaker Alignments.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<p>2.11 Loss of all ERCW flow (cont'd)</p> <p>CAUTION The upper head should be allowed to cool for a minimum of 88 hours prior to complete depressurization of the RCS.</p> <p>47. MAINTAIN plant conditions stable:</p> <ul style="list-style-type: none"> • RCS subcooling based on core exit T/Cs greater than 100°F • Pzr level between 20% [35% ADV] and 65% • Intact S/G narrow range levels between 10% [25% ADV] and 50%. <p>48. ENSURE TSC notified (when staffed) to perform Appendix M, TSC Actions in event of loss of ERCW.</p> <p>49. SHUT DOWN unnecessary plant equipment:</p> <ul style="list-style-type: none"> • REFER TO 0-GO-12, Realignment of Secondary Equipment Following Reactor/Turbine Trip. 		

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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2.11 Loss of all ERCW flow (cont'd)

50. **ENSURE** RCS BORATED for natural circulation cooldown to cold shutdown conditions **USING** EA-68-4, Emergency Boration.

51. **WHEN** sufficient ERCW available to support plant cooldown,
THEN
EVALUATE plant cooldown to Mode 5.

END OF SECTION

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3.0 SYMPTOMS AND ENTRY CONDITIONS

3.1 Symptoms

A. Any of the following annunciators may indicate a failure in the ERCW system:

PANEL XA-55-27A, ERCW	
A-1	UNIT 1 HEADER A PRESSURE LOW
A-4	UNIT 1 HEADER B PRESSURE LOW
B-1	PUMP J-A DISCH PRESS LOW
B-2	PUMP R-A DISCH PRESS LOW
B-3	UNIT 2 HEADER A PRESSURE LOW
B-4	PUMP M-B DISCH PRESS LOW
B-5	PUMP L-B DISCH PRESS LOW
B-6	UNIT 2 HEADER B PRESSURE LOW
C-1	PUMP K-A DISCH PRESS LOW
C-2	PUMP Q-A DISCH PRESS LOW
C-3	UNIT 2 HEADER 2A-A STRAINER DIFF PRESS HIGH
C-4	PUMP N-B DISCH PRESS LOW
C-5	PUMP P-B DISCH PRESS LOW
C-6	UNIT 2 HEADER 2B-B STRAINER DIFF PRESS HIGH
D-1	ERCW 480V MCC 1A-A OR 2A-A UNDERVOLTAGE
D-2	HEADER 1A-A STRAINER DIFF PRESS HIGH
D-4	ERCW 480V MCC 1B-B OR 2B-B UNDERVOLTAGE
D-5	HEADER 1B-B STRAINER DIFF PRESS HIGH
XA-55-27B-A, ERCW/CCS	
E-3	ERCW PUMP MOTOR OVERLOAD
E-4	ERCW/CCS PUMP MOTOR TRIP

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3.1 Symptoms (cont'd)

XA-55-27B-B, CCS	
D-3	HX 1-A1/1-A2 OUTLET TEMPERATURE HIGH
XA-55-27B-D, CCS	
C-1	HX 0-B1/0-B2 OUTLET TEMPERATURE HIGH
D-3	HX 2-A1/2-A2 OUTLET TEMPERATURE HIGH
1-XA-55-15A, ERCW/CCW/FIRE PROTECTION	
B-6	LS-40-72D MECH EQUIP SUMP LVL HI
1-XA-55-15B, ERCW/CCW/FIRE PROTECTION	
A-3	0-LS-40-81D ERCW DECK SUMP LEVEL HI
XA-55-5C, VENTILATION	
B-3	MS-30-241 LOWER COMPT MOISTURE HI
B-4	MS-30-240 UPPER COMPT MOISTURE HI

B. Any of the following parameters may indicate a failure of the ERCW system:

- ERCW header A or B indicates low pressure on PI-67-493A or PI-67-488A.
- ERCW Pump discharge pressure indicates low.
 - PI-67-433A, Pump J-A
 - PI-67-437A, Pump K-A
 - PI-67-461A, Pump Q-A
 - PI-67-465A, Pump R-A
 - PI-67-441A, Pump L-B
 - PI-67-445A, Pump M-B
 - PI-67-453A, Pump N-B
 - PI-67-457A, Pump P-B

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3.1 Symptoms (cont'd)

3. ERCW supply header high or low flow.
 - 1-FI-67-61, Hdr 1A
 - 1-FI-67-62, Hdr 1B
 - 2-FI-67-61, Hdr 2A
 - 2-FI-67-62, Hdr 2B
4. Indication of flooding in the Reactor, Auxiliary, or Turbine Buildings.
5. Visual indication of an ERCW piping rupture.

3.2 Entry Conditions

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4.0 REFERENCES

4.1 Performance

- A. EPIP-1, Emergency Plan Classification Matrix
- B. E-0, Reactor Trip or Safety Injection
- C. AOP-M.03, Loss of Component Cooling Water
- D. AOP-P.01, Loss of Offsite Power
- E. AOP-R.04, Reactor Coolant Pump Malfunctions
- F. TI-28, Curve Book
- G. 1(2)-SO-2/3-1, Condensate and Feedwater System
- H. 0-SO-1-2, Steam Dump System
- J. 1(2)-SO-5-1, Feedwater Heaters and Moisture Separator Reheaters
- I. 0-GO-12, Realignment of Secondary Equipment Following Reactor/Turbine Trip
- K. 0-GO-6, Power Reduction From 30% Reactor Power to Hot Standby

4.2 Plant Drawings

- A. 47W805-1
- B. 1(2)-47W803-1
- C. 1(2)-47W804-1
- D. 45N647-1
- E. 45N601-1

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APPENDIX A

AFFECTED EQUIPMENT LIST (HEADER 1A)

1. Centrifugal Charging Pump 1A Oil Cooler (*Note 1*)
2. Safety Injection Pump 1A Oil Cooler (*Note 1*)
3. Auxiliary and Control Air Compressor A (*Note 1*)
4. Station Service Air Compressors and Space/Room Cooling Equipment (*Note 2*)
5. Lower Containment Coolers 1A and 1C (*Note 3 & 4*)
6. Upper Containment Coolers 1A and 1C (*Note 3 & 4*)
7. Control Rod Drive Vent Coolers 1A and 1C (*Note 3 & 4*)
8. Instrument Room Cooler 1A (*Note 3 & 4*)
9. Main Control Room A/C Condenser A (*Note 4*)
10. Electric Board Room A/C Condenser A (*Note 4*)
11. Shutdown Board Room A/C Chiller A (*Note 4*)
12. Containment Spray Heat Exchanger 1A (*Note 5*)
13. Turbine AFW Pump 1A-S Emergency Suction (*Note 5*)
14. Motor Driven AFW Pump 1A Emergency Suction (if return header A is out-of-service) (*Note 5*)
15. Unit 1 RCP Motor Coolers 1 and 3 (*Note 6*)

Note 1 : Damage is imminent unless equipment is stopped.

Note 2 : Stop equipment if ERCW supply from 1B is not available.

Note 3 : Containment parameters may increase due to inadequate cooling.

Note 4 : Start redundant equipment and secure affected components.

Note 5 : ERCW not normally required.

Note 6 : **REFER TO AOP-R.04, Reactor Coolant Pump Malfunctions, if alarming.**

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APPENDIX B

AFFECTED EQUIPMENT LIST (HEADER 1B)

1. Centrifugal Charging Pump 1B Oil Cooler (*Note 1*)
2. Safety Injection Pump 1B Oil Cooler (*Note 1*)
3. Station Service Air Compressors and Space/Room Cooling Equipment (*Note 2*)
4. Lower Containment Coolers 1B and 1D (*Note 3 & 4*)
5. Upper Containment Coolers 1B and 1D (*Note 3 & 4*)
6. Control Rod Drive Vent Coolers 1B and 1D (*Note 3 & 4*)
7. Instrument Room Cooler 1B (*Note 3 & 4*)
8. Main Control Room A/C Condenser B (*Note 4*)
9. Electric Board Room A/C Condenser B (*Note 4*)
10. Shutdown Board Room A/C Chiller B (*Note 4*)
11. Containment Spray Heat Exchanger 1B (*Note 5*)
12. Turbine AFW Pump 1A-S Emergency Suction (*Note 5*)
13. Motor Driven AFW Pump 1B Emergency Suction (if return header B is out-of-service) (*Note 5*)
14. Unit 1 RCP Motor Coolers 2 and 4 (*Note 6*)

Note 1 : Damage is imminent unless equipment is stopped.

Note 2 : Stop equipment if ERCW supply from 1A is not available.

Note 3 : Containment parameters may increase due to inadequate cooling.

Note 4 : Start redundant equipment and secure affected components.

Note 5 : ERCW not normally required.

Note 6 : **REFER TO AOP-R.04, Reactor Coolant Pump Malfunctions, if alarming.**

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APPENDIX C

AFFECTED EQUIPMENT LIST (HEADER 2A)

1. Centrifugal Charging Pump 2A Oil Cooler (*Note 1*)
2. Safety Injection Pump 2A Oil Cooler (*Note 1*)
3. CCS Heat Exchangers 1A1/1A2 and 2A1/2A2 (*Note 2*)
4. Lower Containment Coolers 2A and 2C (*Note 3 & 4*)
5. Upper Containment Coolers 2A and 2C (*Note 3 & 4*)
6. Control Rod Drive Vent Coolers 2A and 2C (*Note 3 & 4*)
7. Instrument Room Cooler 2A (*Note 3 & 4*)
8. Space and room cooling equipment (*Note 4*)
9. Containment Spray Heat Exchanger 2A (*Note 5*)
10. Turbine AFW Pump 2A-S Emergency Suction (*Note 5*)
11. Motor Driven AFW Pump 2A Emergency Suction (if return header A is out-of-service) (*Note 5*)
12. Unit 2 RCP Motor Coolers 1 and 3 (*Note 6*)

Note 1 : Damage is imminent unless equipment is stopped.

Note 2 : Monitor RCPs for TRIP criteria. Multiple systems affected.

REFER TO AOP-M.03, Loss of Component Cooling Water.

Note 3 : Containment parameters may increase due to inadequate cooling.

Note 4 : Start redundant equipment and secure affected components.

Note 5 : ERCW not normally required.

Note 6 : **REFER TO** AOP-R.04, Reactor Coolant Pump Malfunctions, if alarming.

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APPENDIX D

AFFECTED EQUIPMENT LIST (HEADER 2B)

1. Centrifugal Charging Pump 2B Oil Cooler (*Note 1*)
2. Safety Injection Pump 2B Oil Cooler (*Note 1*)
3. Auxiliary and Control Air Compressor B (*Note 1*)
4. CCS Heat Exchangers 0B1/0B2 (*Note 2*)
5. Lower Containment Coolers 2B and 2D (*Note 3 & 4*)
6. Upper Containment Coolers 2B and 2D (*Note 3 & 4*)
7. Control Rod Drive Vent Coolers 2B and 2D (*Note 3 & 4*)
8. Instrument Room Cooler 2B (*Note 3 & 4*)
9. Space and room cooling equipment (*Note 4*)
10. Containment Spray Heat Exchanger 2B (*Note 5*)
11. Turbine AFW Pump 2A-S Emergency Suction (*Note 5*)
12. Motor Driven AFW Pump 2B Emergency Suction (if return header B is out-of-service) (*Note 5*)
13. Unit 2 RCP Motor Coolers 2 and 4 (*Note 6*)

Note 1 : Damage is imminent unless equipment is stopped.

Note 2 : Multiple systems affected.

REFER TO AOP-M.03, Loss of Component Cooling Water.

Note 3 : Containment parameters may increase due to inadequate cooling.

Note 4 : Start redundant equipment and secure affected components.

Note 5 : ERCW not normally required.

Note 6 : **REFER TO AOP-R.04, Reactor Coolant Pump Malfunctions, if alarming.**

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APPENDIX E

CCS HEAT LOAD REDUCTION [C.1]

The Unit US/SRO shall determine which CCS equipment should be isolated or shutdown to reduce the heat load on Train A CCS Heat Exchangers. The loads listed below are in the order of least severe to most severe plant impact. (1-47W859-2 and 2-47W859-3)

1. Waste Gas Compressors 70-518, INLET (690, by dr to WGC)
70-520, OUTLET (690, by dr to WGC)
2. Sample Heat Exchangers 70-573, INLET (690, Outside RHR Hx Rm)
FCV-70-183, RETURN
3. Post-Accident Sample Coolers 70-766, INLET (706, PASF area)
4. Hot Sample Chillers SAME AS SAMPLE HX
5. Excess Letdown Heat Exchanger FCV-70-143, INLET
FCV-70-85, OUTLET
6. Spent Fuel Pit Heat Exchangers 0-FCV-70-40, 41 INLETS
0-FCV-70-1, 11 OUTLETS
7. RCP Thermal Barriers FCV-70-133,134 INLETS
FCV-70-87,90 OUTLETS
8. Letdown Heat Exchanger 70-574, INLET (714, Near Letdown Hx Rm)
9. Seal Water Heat Exchanger 70-581, INLET (690, Outside RHR Hx Rm)
70-585, OUTLET (690, Outside Seal Water Hx Rm)
10. RCP Upper & Lower Oil Coolers FCV-70-139,140,141 INLETS
FCV-70-89, 92 OUTLETS

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APPENDIX F

RX MOV BOARD ERCW VALVES

NOTE 1 When power is placed on the following valves, record time breaker is closed and opened in the narrative log. An operator shall remain at the breaker and in contact with the MCR while power is on. If a fire develops, position the valve(s) as required and remove power.

NOTE 2 Breakers for Appendix R valves 1,2-FCV-67-22 and 24 are locked.

PERFORM the following:

- TRANSFER** control power to AUXILIARY.
- CLOSE** breakers.
- NOTIFY** Unit Operator to log Appendix R breakers CLOSED.
- STAND BY** for direction from Control Room to manipulate valves.
- OPEN** breakers when directed by the Control Room.
- NOTIFY** Unit Operator to log Appendix R breakers OPEN.

BREAKER	VALVE NAME	VALVE NUMBER
Rx MOV Bd 1A2-A Compt. 3A	ERCW Strainer 1A-A Isol Valve	1-FCV-67-22
Rx MOV Bd 1A2-A Compt. 3C	Aux Bldg Hdr 1A Isol Valve	1-FCV-67-81
Rx MOV Bd 1A2-A Compt. 7A	Hdr 1A Supply to Space Coolers, A/C, & Air Compressors	1-FCV-67-127
Rx MOV Bd 1A2-A Compt. 8B	Hdr 1B to Hdr 2A Isol Valve	1-FCV-67-223
Rx MOV Bd 1A2-A Compt. 9A	Hdr 1A to Hdr 2B Isol Valve	1-FCV-67-147
Rx MOV Bd 1A2-A Compt. 9B	Hdr 1B to Hdr 2A CCS HX Isol Valve	1-FCV-67-424
Rx MOV Bd 1A2-A Compt. 8D	CCS HX 0B1/0B2 Disch Valve to Hdr A	0-FCV-67-151
Rx MOV Bd 1B2-B Compt. 3A	ERCW Strainer 1B-B Isol Valve	1-FCV-67-24
Rx MOV Bd 1B2-B Compt. 3C	Aux Bldg Hdr 1B Isol Valve	1-FCV-67-82
Rx MOV Bd 1B2-B Compt. 6C	Hdr 1B Supply to Space Coolers, A/C, & Air Compressors	1-FCV-67-128

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APPENDIX F

RX MOV BOARD ERCW VALVES

NOTE When power is placed on the following valves, record time breaker is closed and opened in narrative log. An operator shall remain at the breaker and in contact with MCR while power is on. If a fire develops, position valve(s) as required and remove power.

PERFORM the following:

- TRANSFER** control power to AUXILIARY
- CLOSE** breakers
- NOTIFY** Unit Operator to log Appendix R breakers CLOSED
- STAND BY** for direction from Control Room to manipulate valves.
- OPEN** breakers when directed by the Control Room.
- NOTIFY** Unit Operator to log Appendix R breakers OPEN.

BREAKER	VALVE NAME	VALVE NUMBER
Rx MOV Bd 2A2-A Compt. 3A	ERCW Strainer 2A-A Isol Valve	2-FCV-67-22
Rx MOV Bd 2A2-A Compt. 3C	Aux Bldg Hdr 2A Isol Valve	2-FCV-67-81
Rx MOV Bd 2A2-A Compt. 7A	Hdr 2A Supply to Space Coolers, A/C, & Air Compressors	2-FCV-67-127
Rx MOV Bd 2A2-A Compt. 8B	Hdr 2A to Hdr 1B Isol Valve	2-FCV-67-223
Rx MOV Bd 2B2-B Compt. 3A	ERCW Strainer 2B-B Isol Valve	2-FCV-67-24
Rx MOV Bd 2B2-B Compt. 3B	Hdr 2B to Hdr 1A Isol Valve	2-FCV-67-147
Rx MOV Bd 2B2-B Compt. 3C	Aux Bldg Hdr 2B Isol Valve	2-FCV-67-82
Rx MOV Bd 2B2-B Compt. 6C	Hdr 2B Supply to Space Coolers, A/C, & Air Compressors	2-FCV-67-128

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APPENDIX G

ERCW MCC VALVES

NOTE When power is placed on the following valves, record time breaker is closed and opened in narrative log. An operator shall remain at the breaker and in contact with MCR while power is on. If a fire develops, position valve(s) as required and remove power.

PERFORM the following:

- TRANSFER** control power to AUXILIARY
- CLOSE** breakers
- NOTIFY** Unit Operator to log Appendix R breakers CLOSED
- STAND BY** for direction from Control Room to manipulate valves.
- OPEN** breakers when directed by the Control Room.
- NOTIFY** Unit Operator to log Appendix R breakers OPEN.

BREAKER	VALVE NAME	VALVE NUMBER
ERCW MCC 1AA Compt. 3C	Hdr 1A Isol Before Strainer	1-FCV-67-492
ERCW MCC 1B-B Compt. 3C	Hdr 1B Isol Before Strainer	1-FCV-67-489
ERCW MCC 2A-A Compt. 3C	Hdr 2A Isol Before Strainer	2-FCV-67-492
ERCW MCC 2B-B Compt. 3C	Hdr 2B Isol Before Strainer	2-FCV-67-489

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APPENDIX H

DIESEL AUXILIARY BOARD APPENDIX R VALVES

NOTE When power is placed on Appendix R valves record time breaker is closed and opened in narrative log. An operator shall remain at the breaker and in contact with MCR while power is on. If a fire develops, position valve(s) as required and remove power.

PERFORM the following:

- a. **TRANSFER** control power to AUXILIARY
- b. **CLOSE** breakers
- c. **NOTIFY** Unit Operator to log Appendix R breakers CLOSED
- d. **STAND BY** for direction from Control Room to manipulate valves.
- e. **OPEN** breakers when directed by the Control Room.
- f. **NOTIFY** Unit Operator to log Appendix R breakers OPEN.

BREAKER	VALVE NAME	VALVE NUMBER
Diesel Aux Bd 2A2-A Compt. 3C	Hdr A Discharge to Cold Water Channel Isol	0-FCV-67-12
Diesel Aux Bd 2A2-A Compt. 4B	Hdr B Discharge to Cold Water Channel Isol	0-FCV-67-365
Diesel Aux Bd 2B2-B Compt. 3C	Hdr B Discharge to Cold Water Channel Isol	0-FCV-67-14
Diesel Aux Bd 2B2-B Compt. 4B	Hdr A Discharge to Cold Water Channel Isol	0-FCV-67-364

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Installation of Temporary Cooling (HPFP) to CCP Oil Coolers

CAUTION This appendix should be completed as quickly as possible. Normal RADCON requirements may be waived to expedite installation of temporary cooling.

NOTE 1 If the accountability siren sounds, operator should continue performing this appendix. The SM should be aware of task assignments and personnel locations.

NOTE 2 Temporary cooling to the CCP oil coolers is accomplished by installing a hose connection from a HPFP hose station to the oil heat exchangers on the CCP pump skid. This appendix requires removal of a portion of the permanent ERCW supply piping to the Bearing Oil Heat Exchanger to allow hookup of the temporary hoses.

NOTE 3 Fire hose lengths, pre-fabricated tee connections and tools required for hookup are maintained in the EOI/AOP supply box on Aux Bldg el 669' (next to door for HUT B Room).

[1] DETERMINE which CCP to connect temporary cooling: (NA pump not connected)

A-A CCP ☐

B-B CCP ☐

[2] OBTAIN fire hoses (two 50 ft sections), 4 foot red rubber hose, tee connection and tools from EOI/AOP Storage Locker. [AB el 669, next to HUT B Room door] ☐

[3] CLOSE ERCW Supply Valve to CCP Oil Cooler. (NA valve not operated)

Pump	Valve ID	Description	Position
A-A CCP	VLV-67-704A	ERCW Sup A-A CCP Oil Cooler	CLOSED <input type="checkbox"/>
B-B CCP	VLV-67-704B	ERCW Sup B-B CCP Oil Cooler	CLOSED <input type="checkbox"/>

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- [4] **CLOSE** ERCW Return Valve to CCP Oil Cooler. (NA valve not operated)

Pump	Valve ID	Description	Position
A-A CCP	VLV-67-705A	ERCW Ret A-A CCP Oil Cooler	CLOSED <input type="checkbox"/>
B-B CCP	VLV-67-705B	ERCW Ret B-B CCP Oil Cooler	CLOSED <input type="checkbox"/>

- [5] **REMOVE** Drain plug and **OPEN** ERCW Drain Valve to CCP Oil Cooler.
(NA valve not operated)

Pump	Valve ID	Description	Position
A-A CCP	VLV-67-1547A	ERCW Drain A-A CCP Oil Cooler	OPEN <input type="checkbox"/>
B-B CCP	VLV-67-1546B	ERCW Drain B-B CCP Oil Cooler	OPEN <input type="checkbox"/>

NOTE Piping is identified with ID tags at disconnect points.

- [6] **DISCONNECT** ERCW INLET (supply) piping at the compression fittings (two places) shown in Figure 2 of this Appendix and **REMOVE** piping section. ☐

- [7] **CONNECT** temporary hose compression fittings to Oil Cooler and ERCW inlet valve as shown in Figure 3:

- Compression fitting connected to Oil Cooler (6" hard tubing with compression nut from tee connection). ☐
- Compression fitting connected to ERCW inlet valve (4 foot red rubber hose with compression nut). ☐

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[8] **CONNECT** gated WYE hose connection to the nearest HPFP hose station:
(NA valves not used)

- 1-26-668 (near Waste Gas Decay Tank Gallery) ☐
- 2-26-668 (Between Boric Acid Evaporator control panels) ☐
- 0-26-662 (near elevator) ☐

[9] **ENSURE** valves on Gated WYE are **CLOSED**. ☐

[10] **ROLL** out fire hose (with female end at gated wye and male connection in pump room) **AND CONNECT** two 50 ft. lengths together. ☐

[11] **CONNECT** Fire hose to gate wye. ☐

[12] **CONNECT** Fire hose to tee connection. ☐

[13] **CHECK** all hose connections are complete and hose not kinked. ☐

[14] **CLOSE** ERCW Drain Valve to CCP Oil Cooler. (NA valve not operated)

Pump	Valve ID	Description	Position
A-A CCP	VLV-67-1547A	ERCW Drain A-A CCP Oil Cooler	CLOSED <input type="checkbox"/>
B-B CCP	VLV-67-1546B	ERCW Drain B-B CCP Oil Cooler	CLOSED <input type="checkbox"/>

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- [15] ENSURE** ERCW Isolation Valves to CCP Oil Coolers **OPEN**. (NA valves not operated)

Pump	Valve ID	Description	Position
A-A CCP	VLV-67-1544A	ERCW to Bearing Oil Cooler	OPEN <input type="checkbox"/>
	VLV-67-1545A	ERCW Supply to Gear Oil Cooler	OPEN <input type="checkbox"/>
B-B CCP	VLV-67-1544B	ERCW to Bearing Oil Cooler	OPEN <input type="checkbox"/>
	VLV-67-1545B	ERCW Supply to Gear Oil Cooler	OPEN <input type="checkbox"/>

- [16] OPEN** ERCW Return Valve from CCP Oil Cooler: (NA valve not operated)

Pump	Valve ID	Description	Position
A-A CCP	VLV-67-705A	ERCW Ret A-A CCP Oil Cooler	OPEN <input type="checkbox"/>
B-B CCP	VLV-67-705B	ERCW Ret B-B CCP Oil Cooler	OPEN <input type="checkbox"/>

- [17] OPEN** Gated Wye routing valve that supplies the hose connection. ☐
- [18] OPEN** Hose Station Valve to provide HPFP to CCP Oil Coolers. ☐
- [19] VERIFY** fire hose pressurized. ☐
- [20] NOTIFY** UO that temporary cooling water connection to CCP is complete. ☐
- [21] BREACH** CCP room door OPEN to allow room cooling. ☐
- [22] COORDINATE** with Maintenance or Fire Ops to install smoke removal fan to circulate air through CCP room. ☐

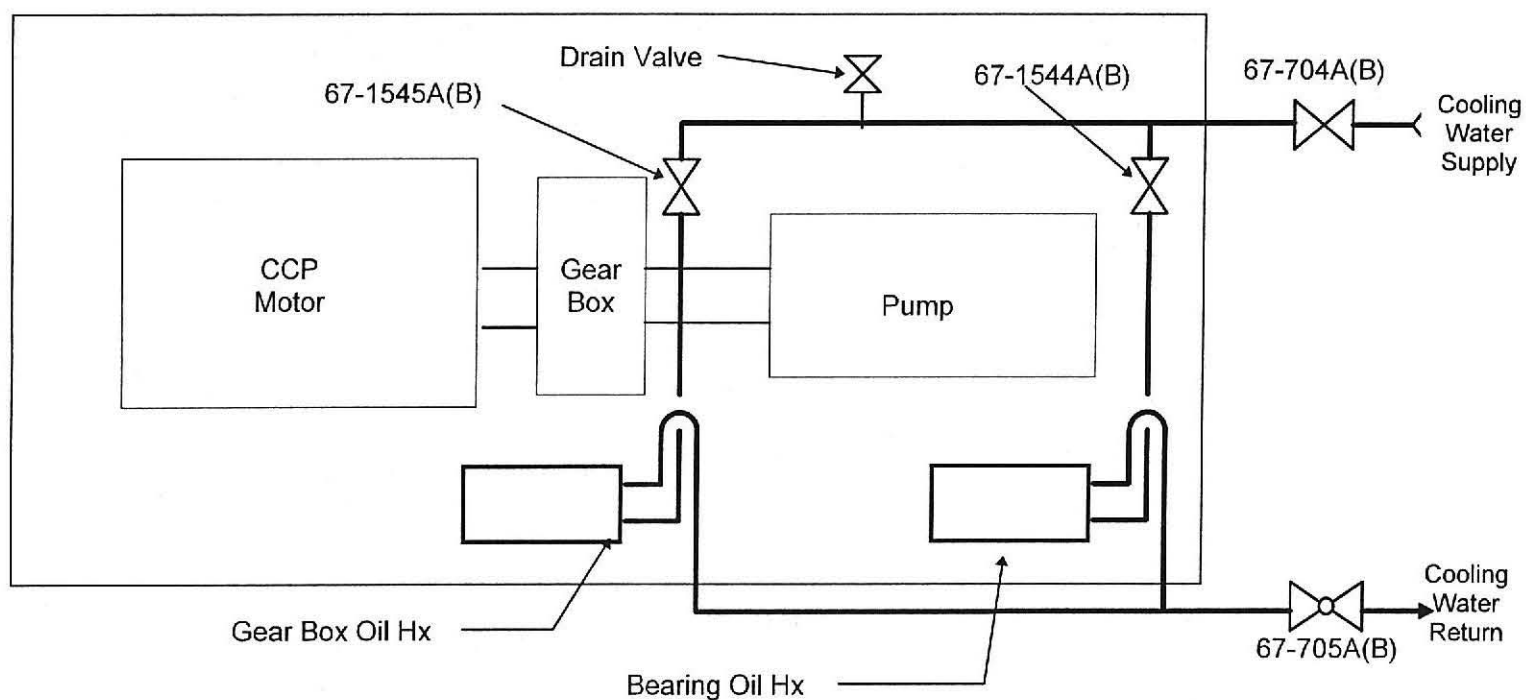
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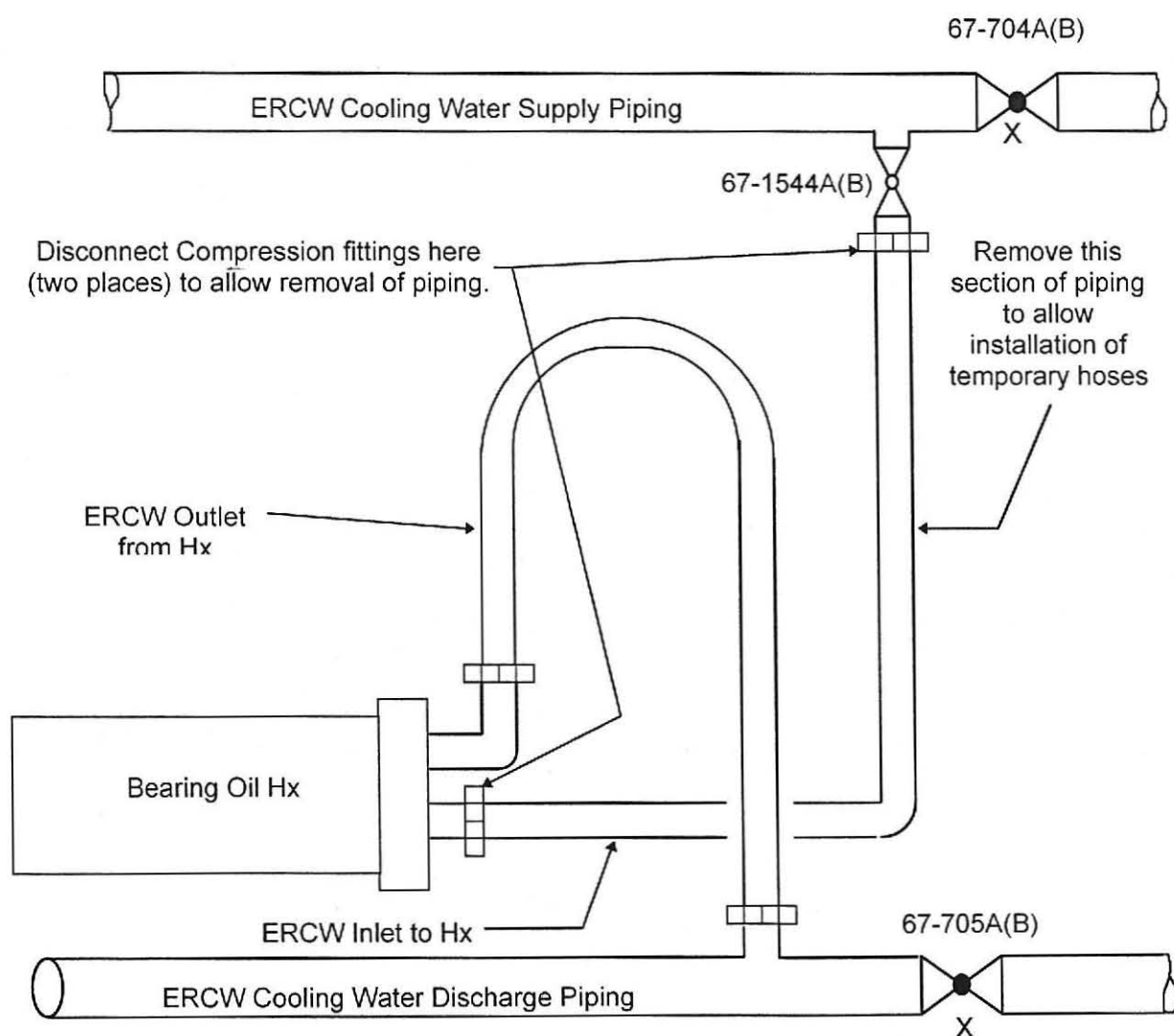
Figure 1

CCP Pump Skid



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Figure 2
CCP Heat Exchanger and Piping Configuration



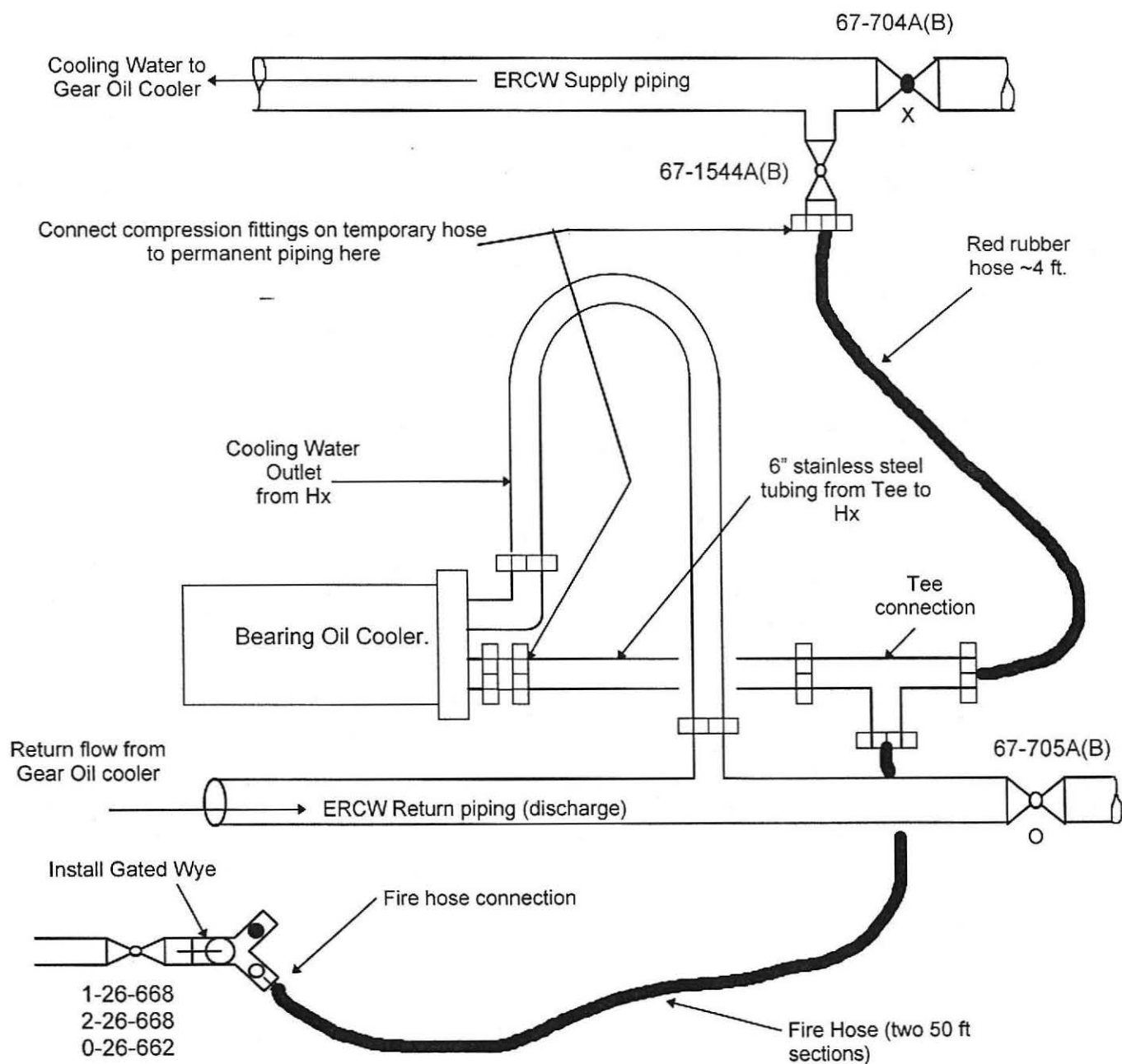
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Figure 3

CCP Heat Exchanger and Piping Configuration (shown with permanent piping removed and temporary hose installed)



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Installation of Temporary Cooling Station Air Compressors

- NOTE 1** This appendix will install a temporary supply of cooling water to the Station Air Compressors. A RCW connection at the Turbine Bldg Space Cooler 1A (el 685 next to stair well) will be disconnected and an adapter fitted to the piping. An adapter will also be fitted to the ERCW supply to the air compressors at VLV-67-1104 & 1105. A fire hose will be installed between the two temporary connections. All components and tools will be stored in an AOP/EOI cabinet located on el 685 Turb Bldg. Under the U1 stairwell.
- NOTE 2** This Appendix incorporates two parts. Part I provides instructions to install temporary cooling from the RCW system. Part II returns the compressor to service and air system.

PART I INSTALLATION OF TEMPORARY CONNECTIONS

PARTS AND TOOLS REQUIRED:

- 2 Adapters: (1) 3 inch 150# flange with 2-1/2 inch male fire hose thread
 (1) 2" female pipe thread to a 2-1/2" female fire hose thread
- Gasket
- Tools for installation: 16" pipe wrench for removal of 2" pipe cap and two wrenches
- Approximately 100 feet of fire hose.

1. **CLOSE** 1-VLV-24-946 RCW supply to Turbine Bldg Space Cooler 1A. ☐
2. **CLOSE** 1-VLV-24-903 RCW outlet from Turbine Bldg Space Cooler 1A. ☐

NOTE Cooler and piping is not drained. Flanges should be broken to allow draining.

3. **DISCONNECT** RCW piping at top flange of 1-TCV-24-210 and at the bottom flange of the flex piping **AND REMOVE** TCV and flex piping. ☐

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4. **IF** RCW isolation valve 1-VLV-24-946 is leaking through,
THEN
CLOSE 1-VLV-24-902 header isolation valve. ☐
5. **INSTALL** 3 inch 150# flange with 2-1/2 inch fire hose thread adapter
at top flange where TCV was removed. ☐
6. **REMOVE** 2 inch cap at 0-67-1104 and 1105.
(located on ERCW piping above the "B" Station Air Compressor). ☐
7. **INSTALL** 2 inch pipe adapter at 0-67-1104 and 1105. ☐
8. **OBTAIN** 100 feet (two 50 ft lengths) of 2-1/2 inch fire hose from Fire Ops
or local hose station. ☐
9. **INSTALL** fire hose between adapters, ensuring that the
hose is not kinked. ☐

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PART II AIR COMPRESSOR START AND SYSTEM ALIGNMENT

NOTE This section will align and start Station Air Compressor A or B. Air compressors C and D cannot be started until after non-essential air pressure is restored.

1. **ALIGN** temporary cooling water by performing the following:
 - a. **ENSURE** Part I of this appendix to connect temporary cooling is complete. ☐
 - b. **NOTIFY** MCR to **CLOSE** 0-FCV-67-205, ERCW supply to Air Compressors. ☐
 - c. **NOTIFY** MCR to **CLOSE** 0-FCV-67-208, ERCW supply to Air Compressors. ☐
 - d. **OPEN** 0-VLV-67-1104 [above B Station Air Compressor]. ☐
 - e. **OPEN** 0-VLV-67-1105 [above B Station Air Compressor]. ☐
 - f. **IF** 1-VLV-24-946 was leaking through in Part I,
THEN
ENSURE 1-VLV-24-902 RCW header isol valve is OPEN. ☐
 - g. **OPEN** 1-VLV-24-946 RCW supply to Turbine Bldg Cooler 1A. ☐
 - h. **VERIFY** temporary hose pressurized. ☐
2. **ENSURE** service air receiver isolation valve **[0-PCV-33-4]** CLOSED. ☐

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PART II AIR COMPRESSOR START AND SYSTEM ALIGNMENT

NOTE If compressor tripped due to high oil temperature, the oil must cool before the alarm/trip condition can be reset.

3. **ENSURE** compressor trip signals RESET, as follows:
 - a. **DEPRESS [0-HS-32-25B]** to reset air compressor trip signals. ☐
 - b. **CHECK** Air Compressor A trip lights DARK:
 - **Low OIL PRESSURE** ☐
 - **High OIL TEMPERATURE** ☐
 - **High DISCHARGE AIR PRESSURE.** ☐
 - c. **CHECK** Air Compressor B trip lights DARK:
 - **Low OIL PRESSURE** ☐
 - **High OIL TEMPERATURE** ☐
 - **High DISCHARGE AIR PRESSURE.** ☐
4. **PLACE** Air Compressor A AUTO/HAND switch **[0-HS-32-25D]** in HAND. ☐
5. **PLACE** Air Compressor B AUTO/HAND switch **[0-HS-32-26A]** in HAND. ☐

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PART II AIR COMPRESSOR START AND SYSTEM ALIGNMENT

6. **PLACE** [HS-32-25A] in Position 1 (AB). ☐
 7. **ENSURE** [0-HS-32-25F] for Air Compressor A in PULL TO START. ☐
 8. **DEPRESS** [0-HS-32-25E] to start Air Compressor A. ☐
 9. **ENSURE** [0-HS-32-26D] for Air Compressor B in PULL TO START. ☐
 10. **DEPRESS** [0-HS-32-26B] to start Air Compressor B. ☐
 11. **CHECK** operation of Air Compressors A and B:
 - a. Air Compressor A cooling water flow INDICATED on [0-FG-32-44B]. ☐
 - b. Air Compressor B cooling water flow INDICATED on [0-FG-32-24B]. ☐
 12. **MAINTAIN** air pressure in receiver tanks between 80 psig and 100 psig. ☐
- NOTE 1** [0-FCV-32-82] and [0-FCV-32-85] close automatically below approximately 69 psig.
- NOTE 2** Handswitch must be held in OPEN position until aux air header is pressurized.
13. **OPEN** Train A control air supply [0-FCV-32-82] to supply Train A auxiliary air [Aux Bldg, elev 734, Panel 0-L-321]. ☐
 14. **OPEN** Train B control air supply [0-FCV-32-85] to supply Train B auxiliary air [Aux Bldg, elev 734, Panel 0-L-322]. ☐

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PART II AIR COMPRESSOR START AND SYSTEM ALIGNMENT

15. **NOTIFY** MCR that control air pressure has been restored
AND remote control of the following systems may be restored:

☐

- Auxiliary Feedwater LCVs
- Charging Flow Control
- Atmospheric Relief Valves

16. **IF** Phase B is NOT actuated,
THEN —
ESTABLISH air to containment on selected unit:
[714 pen room]

UNIT	VALVE NUMBER	DESCRIPTION	OPEN √
1	FCV-32-80	Reactor Bldg Train A essential air isolation	<input type="checkbox"/>
	FCV-32-102	Reactor Bldg Train B essential air isolation	<input type="checkbox"/>
	FCV-32-110	Reactor Bldg nonessential air isolation	<input type="checkbox"/>
2	FCV-32-81	Reactor Bldg Train A essential air isolation	<input type="checkbox"/>
	FCV-32-103	Reactor Bldg Train B essential air isolation	<input type="checkbox"/>
	FCV-32-111	Reactor Bldg nonessential air isolation	<input type="checkbox"/>

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APPENDIX K

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LOCAL CONTROL OF MOTOR-DRIVEN AFW FLOW

NOTE If the accountability siren sounds, operator should continue performing this appendix. The SM should be aware of task assignments and personnel locations.

1. **IDENTIFY** applicable unit:

- Unit 1 _____
- Unit 2 _____

2. **OBTAIN** radio, gloves and M-5 key. ☐

NOTE 1 On loss of power or air, the MD AFW main LCVs fail open and the bypass LCVs fail closed.

NOTE 2 AFW isolation valves in the following step are locked open.

3. **WHEN** directed to control Motor Driven Auxiliary Feedwater flow,
THEN
THROTTLE or **CLOSE** motor-driven AFW isolation valves as directed:

S/G	VALVE NUMBER	LOCATION	✓
1	VLV-3-836	Inside WWVR, on platform	<input type="checkbox"/>
2	VLV-3-835	AB el. 714 Pen Rm Above WWVR entrance	<input type="checkbox"/>
3	VLV-3-834	AB el. 714 Pen Rm Above WWVR entrance	<input type="checkbox"/>
4	VLV-3-837	Inside WWVR, on platform	<input type="checkbox"/>

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LOCAL CONTROL OF MOTOR-DRIVEN AFW FLOW

4. **WHEN** directed to restore Motor Driven AFW control to Main Control Room,
THEN
LOCK OPEN AFW isolation valves as directed:

S/G	VALVE NO.	LOCATION	LOCKED OPEN
1	VLV-3-836	Inside WWVR, on platform	<input type="checkbox"/>
2	VLV-3-835	AB el. 714 Pen Rm Above WWVR entrance	<input type="checkbox"/>
3	VLV-3-834	AB el. 714 Pen Rm Above WWVR entrance	<input type="checkbox"/>
4	VLV-3-837	Inside WWVR, on platform	<input type="checkbox"/>

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LOCAL CONTROL OF TURBINE DRIVEN AFW LCVS

NOTE On loss of power or control air, the TD AFW pump LCVs fail open.

1. **OBTAIN** handheld lighting, radios, and gloves. ☐

2. **ESTABLISH** communications between local operator and MCR. ☐

NOTE TD AFW LCVs are turned clockwise to close.

3. **COORDINATE** with MCR and **CONTROL** S/G levels by locally operating handwheels on appropriate LCVs:

S/G	LCV	LOCATION	THROTTLED OR CLOSED
1	LCV-3-174	Inside West Valve Vault Room	<input type="checkbox"/>
2	LCV-3-173	AB el. 714 Pent. Rm Above WVVR Entrance	<input type="checkbox"/>
3	LCV-3-172	AB el. 714 Pent. Rm Above WVVR Entrance	<input type="checkbox"/>
4	LCV-3-175	Inside West Valve Vault Room	<input type="checkbox"/>

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TSC ACTIONS IN THE EVENT OF LOSS OF ERCW

NOTE 1 The appendix provides listing of immediate concerns and recommendations to be evaluated when the TSC is activated. This is not an all inclusive list.

NOTE 2 Applicable portions of the following procedures may be used to establish temporary cooling water:

- 0-MA-REM-000-001.0, Extended Station Blackout
- 0-MA-MS-317-200.0, Connection of Blackout Diesel Driven Pump to High Pressure Fire Protection System on Loss of ERCW
- 0-MA-MS-317-200.2, Connection of High Pressure Fire Protection to ERCW on Loss of ERCW

1. **NOTIFY** TSC to evaluate the following:

- Providing makeup supply to CSTs.
- Providing temporary cooling water supplies to the following components.
 - MCR chiller packages.
 - Diesel Generators
- Providing temporary area/room cooling to the following components.
 - CCP rooms
 - MDAFW pump area
 - RHR pump room
- Maintenance of Fire Protection Storage Tank level.
- Initiation of repairs to restore ERCW system
- Establishing temporary ERCW for long term plant operation and plant shutdown.

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LOCAL ISOLATION OF RCP SEAL INJECTION

NOTE If the accountability siren sounds, operator should continue performing this appendix. The SM should be aware of task assignments and personnel locations.

1. **IDENTIFY** applicable unit:

Unit 1 _____

Unit 2 _____

2. **OBTAIN** radio and gloves. ☐

3. **ISOLATE** RCP seal injection:

[Aux Bldg, elev 690, reach rods outside seal water injection filter cubicles]

a. **CLOSE** seal water injection filter bypass VLV-62-546. ☐

b. **CLOSE** seal water injection filter A outlet VLV-62-549. ☐

c. **CLOSE** seal water injection filter B outlet VLV-62-550. ☐

4. **NOTIFY** MCR that seal injection is isolated on affected unit. ☐

END OF TEXT

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HANDOUT FOR SECTION 2.11 LOSS OF ALL ERCW FLOW

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STEP	ACTION
9.	MONITOR RCS temperature: a. IF T-cold less than 547°F, THEN CONTROL AFW flow to S/Gs between 440 and 600 gpm: b. IF T-cold greater than 552°F, THEN locally operate atmospheric relief valves
10.	MONITOR AFW pump status a. CONTROL TD AFW flow USING EA-3-1. d. WHEN backup air supply depleted, THEN DISPATCH personnel to locally control TD AFW LCVs USING Appendix L. e. MAINTAIN AFW flow greater than 440 gpm UNTIL narrow range level greater than 10% [25% ADV] in at least one S/G.
11.	CONTROL S/G narrow range levels between 10% [25% ADV] and 50%.
13.	MONITOR FR-0 status trees for information only.
15.	MAINTAIN RCS T-cold between 540°F and 552°F USING Local Control of S/G #1 and 4 atmospheric relief valves.
16.c	MONITOR hotwell levels stable or dropping.
17.	MONITOR containment vacuum relief normal: IF containment pressure less than 1.0 psig then verify containment vacuum relief valves OPEN.
20.	MONITOR RCP seal cooling available: a. CHECK Train A CCS Outlet temperature less than 130°F. b. CHECK RCP seal cooling flow in service: <ul style="list-style-type: none"> • CCP running and supplying RCP Seal Injection flow. OR • Thermal barrier cooling in service.
21.	MONITOR if CCP can be started: a. CHECK Temporary cooling water is established to CCP oil cooler. b. CHECK thermal barrier cooling in service OR seal injection flowpath isolated. e. MONITOR CCP bearing and motor winding temperatures. f. CONTROL CCP flow.

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HANDOUT FOR SECTION 2.11 LOSS OF ALL ERCW FLOW

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STEP	ACTION
22.	MONITOR pressurizer pressure between 2210 and 2260 psig.
23.	MAINTAIN pressurizer level between 20% [35% ADV] and 65%.
24.	MONITOR if RCS cooldown should be started. a. CHECK pwr level greater than 10% [20% ADV].
25.	a. MAINTAIN S/G level greater than 10% [25% ADV] while depressurizing S/Gs. c. STOP cooldown and MAINTAIN current plant conditions if <ul style="list-style-type: none"> • Charging pump started • T-cold less than 280°F. • RCS pressure between 100 psig and 200 psig.
26.	MONITOR SI signal status.
28.	MONITOR Phase B actuated.
36.	MONITOR ECCS flow NOT required: <ul style="list-style-type: none"> • Pressurizer level is maintained greater than 10% [20% ADV]. • RCS subcooling based on core exit T/Cs greater than 40°F.
37.	MAINTAIN pressurizer level between 20% [35% ADV] and 65%.
42.	MONITOR RCS cooldown.
43.	INITIATE RCS depressurization: a. MAINTAIN RCS subcooling based on core exit T/Cs greater than 140°F.
44.	CONTINUE RCS cooldown and depressurization: a. MAINTAIN T-cold cooldown rate less than 50°F/hr. b. MAINTAIN RCS subcooling based on core exit T/Cs greater than 140°F. c. MAINTAIN RCS T-cold and pressure within limits USING Tech Spec temperature/pressure limit curves.
45.	MONITOR NO steam voids in reactor vessel.
46.	WHEN RCS pressure less than 1000 psig, THEN ISOLATE CLAs.
47.	MAINTAIN plant conditions stable.

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HANDOUT FOR SECTION 2.11

LOSS OF ALL ERCW FLOW

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STEP	ACTION
9.	MONITOR RCS temperature: a. IF T-cold less than 547°F, THEN CONTROL AFW flow to S/Gs between 440 and 600 gpm: b. IF T-cold greater than 552°F, THEN locally operate atmospheric relief valves
10.	MONITOR AFW pump status a. CONTROL TD AFW flow USING EA-3-1. d. WHEN backup air supply depleted, THEN DISPATCH personnel to locally control TD AFW LCVs USING Appendix L. e. MAINTAIN AFW flow greater than 440 gpm UNTIL narrow range level greater than 10% [25% ADV] in at least one S/G.
11.	CONTROL S/G narrow range levels between 10% [25% ADV] and 50%.
13.	MONITOR FR-0 status trees for information only.
15.	MAINTAIN RCS T-cold between 540°F and 552°F USING Local Control of S/G #1 and 4 atmospheric relief valves.
16.c	MONITOR hotwell levels stable or dropping.
17.	MONITOR containment vacuum relief normal: IF containment pressure less than 1.0 psig then verify containment vacuum relief valves OPEN.
20.	MONITOR RCP seal cooling available: a. CHECK Train A CCS Outlet temperature less than 130°F. b. CHECK RCP seal cooling flow in service: <ul style="list-style-type: none"> • CCP running and supplying RCP Seal Injection flow. OR • Thermal barrier cooling in service.
21.	MONITOR if CCP can be started: a. CHECK Temporary cooling water is established to CCP oil cooler. b. CHECK thermal barrier cooling in service OR seal injection flowpath isolated. e. MONITOR CCP bearing and motor winding temperatures. f. CONTROL CCP flow.

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HANDOUT FOR SECTION 2.11 LOSS OF ALL ERCW FLOW

COPY 2 (page 2 of 2)

STEP	ACTION
22.	MONITOR pressurizer pressure between 2210 and 2260 psig.
23.	MAINTAIN pressurizer level between 20% [35% ADV] and 65%.
24.	MONITOR if RCS cooldown should be started. a. CHECK pwr level greater than 10% [20% ADV].
25.	a. MAINTAIN S/G level greater than 10% [25% ADV] while depressurizing S/Gs. c. STOP cooldown and MAINTAIN current plant conditions if <ul style="list-style-type: none"> • Charging pump started • T-cold less than 280°F. • RCS pressure between 100 psig and 200 psig.
26.	MONITOR SI signal status.
28.	MONITOR Phase B actuated.
36.	MONITOR ECCS flow NOT required: <ul style="list-style-type: none"> • Pressurizer level is maintained greater than 10% [20% ADV]. • RCS subcooling based on core exit T/Cs greater than 40°F.
37.	MAINTAIN pressurizer level between 20% [35% ADV] and 65%.
42.	MONITOR RCS cooldown.
43.	INITIATE RCS depressurization: a. MAINTAIN RCS subcooling based on core exit T/Cs greater than 140°F.
44.	CONTINUE RCS cooldown and depressurization: a. MAINTAIN T-cold cooldown rate less than 50°F/hr. b. MAINTAIN RCS subcooling based on core exit T/Cs greater than 140°F. c. MAINTAIN RCS T-cold and pressure within limits USING Tech Spec temperature/pressure limit curves.
45.	MONITOR NO steam voids in reactor vessel.
46.	WHEN RCS pressure less than 1000 psig, THEN ISOLATE CLAs.
47.	MAINTAIN plant conditions stable.

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APPENDIX P

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POTENTIAL TECH SPEC IMPACTS

- NOTES**
- When ERCW Headers are crosstied the actions of LCO 3.0.3 are applicable. Steps to record the time a cross-connect valve is opened should be used as an aid for tracking LCO action times.
 - With one or both ERCW loops inoperable, all affected LCOs should be evaluated. Only LCO 3.7.4 and any which have more limiting requirements need to be logged as entered.

1. **EVALUATE** the following Tech Specs and TRM for applicability:
 - 3.0.3, Limiting Condition for Operation
 - TR 3.1.2.1, Boration Flowpath - Shutdown
 - TR 3.1.2.2, Boration Flowpath - Operating
 - TR 3.1.2.3, Charging Pump - Shutdown
 - TR 3.1.2.4, Charging Pump - Operating
 - 3.4.1.1, Reactor Coolant Loops - Startup and Power Ops
 - 3.4.1.2, Reactor Coolant Loops and Coolant Circulation - Hot Standby
 - 3.4.1.3, Reactor Coolant Loops and Coolant Circulation - Shutdown

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1. (Continued)

- 3.5.2, ECCS Subsystems T-avg $\geq 350^{\circ}\text{F}$
- 3.5.3, ECCS Subsystems T-avg $< 350^{\circ}\text{F}$
- 3.6.1.8, EGTS - Cleanup Subsystem
- 3.6.1.5, Containment Air Temperature
- 3.6.2.1, Containment Spray
- 3.6.2.2, Lower Containment Coolers
- 3.7.1.2, Auxiliary Feedwater
- 3.7.3, Component Cooling Water
- 3.7.4, ERCW
- 3.7.8, ABGTS
- 3.8.1.1, A.C. Sources - Operating
- 3.8.1.2, A.C. Sources - Shutdown

END OF TEXT

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COMMITMENT LIST

COMMITMENT ID	SUMMARY OF COMMITMENT	COMMITMENT CORRESPONDENCE
C.1	Identify non-essential heat loads that could be isolated in the event system realignment is required. S 64 940314 800	NCO 940176001
C.2	Provide guidance on the required use of AOIs during the performance of EOPs. EPM-4, EOI Program Manual User's Guide	SQPER930177 IFI-93-300-02
C.3	Developed section 2.11 to address operator response to complete loss of ERCW.	NCO 020002001

SEQUOYAH NUCLEAR PLANT JOB PERFORMANCE MEASURE

B.1.g

Respond to Spray Valve Failure

Original Signatures on File

**PREPARED/
REVISED BY:**

Date/

VALIDATED BY:

*

Date/

APPROVED BY:

Date/

(Operations Training Manager)

CONCURRED:

**

Date/

(Operations Representative)

* Validation not required for minor enhancements, procedure Rev changes that do not affect the JPM, or individual step changes that do not affect the flow of the JPM.

** Operations Concurrence required for new JPMs and changes that affect the flow of the JPM (if not driven by a procedure revision).

NUCLEAR TRAINING
REVISION/USAGE LOG

[illegible]

V - Specify if the JPM change will require another validation (Y or N).
See cover sheet for criteria.

SEQUOYAH NUCLEAR PLANT
RO/SRO
JOB PERFORMANCE MEASURE

Task:

Respond to Spray Valve failure

J/TA task # : 3210140401 (RO) 0150050101 (RO) 0150040101 (RO)
0000910501 (RO)

K/A Ratings:

010A2.02	3.9/3.9
010A4.01	3.7/3.5
008AA2.19	3.4/3.6

Task Standard:

RCPs supplying failed spray valve are tripped. Pressurizer heaters are energized.

Evaluation Method : Simulator X In-Plant _____

Performer: _____

NAME

Start Time _____

Performance Rating : SAT _____ UNSAT _____ Performance Time _____

Finish Time _____

Evaluator: _____

SIGNATURE

DATE

COMMENTS

SPECIAL INSTRUCTIONS TO EVALUATOR:

1. Critical steps are identified within the step.
2. Sequenced steps identified by an "s"
3. Any UNSAT requires comments
4. Initialize the simulator in **IC 90** or initialize the simulator in IC 16 and complete the following:
 - a. Initiate a reactor trip and insert malfunction, **IMF RC06A f:20** to partially open one spray valve simulating a partially stuck open spray valve;
 - b. Allow RCS pressure to drop to, but not less than, approximately 2100-2150 psig at ES-0.1 Step 8, MONITOR Pressurizer pressure control;
 - c. Turn the 'D' bank pressurizer heaters off; and,
 - d. Freeze the simulator.
5. Ensure operator performs the following required actions for **SELF-CHECKING**:
 - a. Identifies the correct unit, train, component, etc.
 - b. Reviews the intended action and expected response.
 - c. Compares the actual response to the expected response.

Validation Time: CR. 11 mins Local _____

Tools/Equipment/Procedures Needed:
ES-0.1

References:

	Reference	Title	Rev No.
A.	ES-0.1	Reactor Trip Response	30

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READ TO OPERATOR

DIRECTIONS TO TRAINEE:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM. I will provide initiating cues and reports on other actions when directed by you. When you complete the task successfully, the objective for this job performance measure will be satisfied. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the handout sheet I provided you.

INITIAL CONDITIONS:

1. Unit has tripped.
2. Transition to ES-0.1 has been performed.

INITIATING CUES:

You have been directed to stabilize the unit in accordance with ES-0.1, beginning at step 1.

Notify the US when the unit is stable

Job Performance Checklist:

STEP/STANDARD	SAT/UNSAT
<p>Evaluator Note: Applicant may take action related to critical steps prior to reaching required steps by use of the ES-0.1 Handout.</p>	
<p><u>STEP 1.:</u> Obtain the appropriate procedure.</p> <p><u>STANDARD:</u> Operator obtains a copy of ES-0.1.</p> <p><u>COMMENTS:</u></p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Start Time ___</p>
<p><u>STEP 2.:</u> [1] MONITOR SI NOT actuated:</p> <ul style="list-style-type: none"> • SI ACTUATED permissive DARK [M-4A, D4] <p><u>STANDARD:</u> Determines SI is NOT actuated by observing annunciator M-4A-D4 permissive is dark</p> <p><u>COMMENTS:</u></p>	<p>___ SAT</p> <p>___ UNSAT</p>
<p><u>STEP 3.:</u> [2] VERIFY generator breakers OPEN.</p> <p><u>STANDARD:</u> Verifies generator breakers open by observing green lights on 1-M-1 benchboard.</p> <p><u>COMMENTS:</u></p>	<p>___ SAT</p> <p>___ UNSAT</p>
<p><u>STEP 4.:</u> [3] MONITOR RCS temperatures:</p> <ul style="list-style-type: none"> • RCPs Running: CHECK T-Tavg stable at or trending to between 547°F and 552°F. <p><u>STANDARD:</u> Determines T-Tavg is stable at or trending to between 547°F and 552°F.</p> <p><u>COMMENTS:</u></p>	<p>___ SAT</p> <p>___ UNSAT</p>

Job Performance Checklist:

STEP/STANDARD	SAT/UNSAT
<p>STEP 5. [4] MONITOR feedwater status:</p> <ul style="list-style-type: none"> • T-Tavg less than 550°F. • MFW regulating valves CLOSED. • MFW regulating bypass valve controller outputs ZERO. • MFW isolation valves CLOSED. • MFW pumps TRIPPED. • MFW flow ZERO. • Total feed flow to SIGs greater than 440 gpm. <p><u>STANDARD:</u> Determines Tavg is NOT less than 550°F and goes to step 5.</p> <p><u>COMMENTS:</u></p>	<p>___ SAT</p> <p>___ UNSAT</p>
<p>STEP 6.: [5] CHECK if emergency boration is required:</p> <p>[a] VERIFY all control rods fully inserted:</p> <ul style="list-style-type: none"> • Rod bottom lights LIT • Rod position indicators less than or equal to 12 steps. <p><u>STANDARD:</u> Determines All rod Bottom lights are illuminated.</p>	<p>___ SAT</p> <p>___ UNSAT</p>
<p>STEP 7.: [b] MONITOR RCS temperature:</p> <ul style="list-style-type: none"> • T-Tavg greater than 540°F if any RCP running <p><u>STANDARD:</u> Determines T-Tavg is approximately 551°F</p> <p><u>COMMENTS:</u></p>	<p>___ SAT</p> <p>___ UNSAT</p>
<p>STEP 8.: [6] ANNOUNCE reactor trip USING PA system.</p> <p><u>STANDARD:</u> Announces reactor trip over PA system</p> <p><u>COMMENTS:</u></p>	<p>___ SAT</p> <p>___ UNSAT</p>

Job Performance Checklist:

STEP/STANDARD	SAT/UNSAT
<p>STEP 9.: [7] MONITOR pressurizer level control:</p> <ul style="list-style-type: none"> CHECK pressurizer level greater than 17%. VERIFY charging IN SERVICE. VERIFY letdown IN SERVICE. CHECK pressurizer level trending to 25% (normal range 20% to 30%). <p>STANDARD: Determines Charging and Letdown are in service and PZR level is >17% and trending to 25%.</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p>
<p>STEP 10.: [8] MONITOR pressurizer pressure control:</p> <ul style="list-style-type: none"> Pressurizer pressure greater than 1870 psig. Pressurizer pressure stable at or trending to 2235 psig (normal range 2210 psig to 2260 psig). <p>STANDARD: Determines PZR pressure >1870 but NOT trending toward 2210-2260 psig.</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p>
<p>EVALUATOR NOTE: JPM steps 11,12 and 13 are from procedure step 8 RNO</p>	
<p>STEP 11.: IF pressure less than 2235 psig and dropping, THEN PERFORM the following:</p> <ul style="list-style-type: none"> ENSURE pressurizer PORVs CLOSED. (not critical) ENSURE spray valves CLOSED. (not critical) IF spray valve(s) CANNOT be closed, THEN STOP RCPs #1 and 2. IF pressurizer pressure continues to drop, THEN STOP additional RCPs as necessary. (not critical) ENSURE all pressurizer heaters ON. <p>STANDARD: Stops Number 1 & 2RCP by rotating handswitches counter-clockwise.</p> <p>COMMENTS:</p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Critical Step</p>

Job Performance Checklist:

STEP/STANDARD	SAT/UNSAT
<p><u>STEP 12.:</u> IF pressure less than 2235 psig and dropping, THEN PERFORM the following:</p> <ul style="list-style-type: none"> • ENSURE pressurizer PORVs CLOSED. (not critical) • ENSURE spray valves CLOSED. (not critical) • IF spray valve(s) CANNOT be closed, THEN STOP RCPs #1 and 2. • IF pressurizer pressure continues to drop, THEN STOP additional RCPs as necessary. (not critical) • ENSURE all pressurizer heaters ON. <p><u>STANDARD:</u> Manually energized PZR heater Bank D by rotating handswitch clockwise.</p> <p><u>COMMENTS:</u></p>	<p>___ SAT</p> <p>___ UNSAT</p> <p>Critical Step</p> <p>Stop Time___</p>

End of JPM

CANDIDATE CUE SHEET
(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

DIRECTION TO TRAINEE:

I will explain the initial conditions, and state the task to be performed. All control room steps shall be performed for this JPM, including any required communications. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task return the handout sheet I provided you.

INITIAL CONDITIONS:

Unit has tripped.

Transition to ES-0.1 has been performed.

INITIATING CUES:

You have been directed to stabilize the unit in accordance with ES-0.1, beginning at step 1.

Notify the US when the unit is stable

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT

EOI PROGRAM MANUAL

EMERGENCY SUBPROCEDURE

ES-0.1

REACTOR TRIP RESPONSE

Revision 30

QUALITY RELATED

PREPARED/PROOFREAD BY: D. A. PORTER

RESPONSIBLE ORGANIZATION: OPERATIONS

APPROVED BY: W. T. LEARY

EFFECTIVE DATE: 08/01/2005

REVISION

DESCRIPTION:

Added new step which checks generator PCBs open. This step is being relocated from E-0 Step 3 in conjunction with incorporation of E-0A. Revised step 11.b to provide details on placing steam dumps in pressure mode.

This procedure has a handout page (2 copies) and foldout page.

SQN	REACTOR TRIP RESPONSE	ES-0.1 Rev. 30
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FOLDOUT PAGE

SI ACTUATION CRITERIA

IF either of the following conditions occurs:

- RCS subcooling based on core exit T/Cs less than 40°F
- OR
- Pressurizer level CANNOT be maintained greater than 5%,

THEN

ACTUATE SI and GO TO E-0, Reactor Trip or Safety Injection.

EVENT DIAGNOSTICS

IF both trains of shutdown boards deenergized,

THEN

GO TO ECA-0.0, Loss of All AC Power.

TANK SWITCHOVER SETPOINTS

IF CST level less than 5%,

THEN

ALIGN AFW suction to ERCW.

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HANDOUT

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STEP	ACTION
FOP	IF RCS subcooling based on core exit T/Cs less than 40°F OR Pressurizer level CANNOT be maintained greater than 5%, THEN ACTUATE SI and GO TO E-0, Reactor Trip or Safety Injection.
FOP	IF CST level less than 5%, THEN ALIGN AFW suction to ERCW.
1.	MONITOR SI NOT actuated:
3.	MONITOR RCS temperatures stable at or trending to between 547°F and 552°F.
3.c. RNO	(if RCS temperature continues to drop) <ul style="list-style-type: none"> • CONTROL total feed flow to minimize RCS cooldown. • MAINTAIN total feed flow greater than 440 gpm UNTIL narrow range level greater than 10% in at least one S/G.
4.	MONITOR feedwater status: (verify FWI when T-avg less than 550°F)
5.b.	MONITOR RCS temperatures greater than 540°F.
7.	MONITOR pressurizer level control: (pressurizer level greater than 17%)
7.a. RNO	(if pwr level less than 17%) <ol style="list-style-type: none"> CONTROL charging to restore pressurizer level greater than 17%. WHEN pressurizer level greater than 17%, THEN OPERATE pressurizer heaters as necessary.
7.c. RNO	(if letdown not in service) WHEN charging established AND pressurizer level greater than 17%, THEN ESTABLISH letdown.
7.d. RNO	(if pwr level is NOT trending to 25%) CONTROL charging and letdown to maintain pressurizer level at 25% (normal range 20% to 30%).
8.	MONITOR pressurizer pressure control: (pwr pressure greater than 1870 psig and stable at or trending to 2235 psig)
8.b.2) RNO	(if pwr pressure greater than 2235 psig and rising) CONTROL pressure.
9.	MAINTAIN S/G narrow range levels: (between 10% and 50%)
9.a. RNO	(if S/G levels less than 10%) MAINTAIN total feed flow greater than 440 gpm UNTIL level greater than 10%.

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HANDOUT

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STEP	ACTION
12.b. 2). RNO	(if NO RCP can be started) MONITOR natural circulation.
13.	MONITOR if source range channels should be reinstated: (IRM flux less than 10^{-4} % power)
15.	MAINTAIN stable plant conditions: <ul style="list-style-type: none"> a. Pressurizer pressure at 2235 psig (normal range 2210 psig to 2260 psig) b. Pressurizer level at 25% (normal range 20% to 30%) c. S/G narrow range levels between 10% and 50% d. RCS temperature at 547°F (between 540°F and 550°F)

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HANDOUT

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STEP	ACTION
FOP	IF RCS subcooling based on core exit T/Cs less than 40°F OR Pressurizer level CANNOT be maintained greater than 5%, THEN ACTUATE SI and GO TO E-0, Reactor Trip or Safety Injection.
FOP	IF CST level less than 5%, THEN ALIGN AFW suction to ERCW.
1.	MONITOR SI NOT actuated:
3.	MONITOR RCS temperatures stable at or trending to between 547°F and 552°F.
3.c. RNO	(if RCS temperature continues to drop) <ul style="list-style-type: none"> CONTROL total feed flow to minimize RCS cooldown. MAINTAIN total feed flow greater than 440 gpm UNTIL narrow range level greater than 10% in at least one S/G.
4.	MONITOR feedwater status: (verify FWI when T-avg less than 550°F)
5.b.	MONITOR RCS temperatures greater than 540°F.
7.	MONITOR pressurizer level control: (pressurizer level greater than 17%)
7.a. RNO	(if pwr level less than 17%) 3) CONTROL charging to restore pressurizer level greater than 17%. 4) WHEN pressurizer level greater than 17%, THEN OPERATE pressurizer heaters as necessary.
7.c. RNO	(if letdown not in service) WHEN charging established AND pressurizer level greater than 17%, THEN ESTABLISH letdown.
7.d. RNO	(if pwr level is NOT trending to 25%) CONTROL charging and letdown to maintain pressurizer level at 25% (normal range 20% to 30%).
8.	MONITOR pressurizer pressure control: (pwr pressure greater than 1870 psig and stable at or trending to 2235 psig)
8.b.2) RNO	(if pwr pressure greater than 2235 psig and rising) CONTROL pressure.
9.	MAINTAIN S/G narrow range levels: (between 10% and 50%)
9.a. RNO	(if S/G levels less than 10%) MAINTAIN total feed flow greater than 440 gpm UNTIL level greater than 10%.

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HANDOUT

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STEP	ACTION
12.b. 2). RNO	(if NO RCP can be started) MONITOR natural circulation.
13.	MONITOR if source range channels should be reinstated: (IRM flux less than 10^{-4} % power)
15.	MAINTAIN stable plant conditions: a. Pressurizer pressure at 2235 psig (normal range 2210 psig to 2260 psig) b. Pressurizer level at 25% (normal range 20% to 30%) c. S/G narrow range levels between 10% and 50% d. RCS temperature at 547°F (between 540°F and 550°F)

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1.0 PURPOSE

This procedure provides the necessary instructions to stabilize and control the plant following a reactor trip WITHOUT a safety injection.

2.0 SYMPTOMS AND ENTRY CONDITIONS

2.1 ENTRY CONDITIONS

E-0 Reactor Trip or Safety Injection


- SI NOT actuated and NOT required

3.0 OPERATOR ACTIONS

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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NOTE This procedure has a foldout page.

- | | |
|--|--|
| <p>1. MONITOR SI NOT actuated:</p> <ul style="list-style-type: none"> • SI ACTUATED permissive DARK [M-4A, D4] | <p>IF SI actuated,
THEN
GO TO E-0, Reactor Trip or Safety Injection.</p>  |
| <p>2. VERIFY generator breakers OPEN.</p> | <p>OPEN generator breakers.</p> |

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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3. MONITOR RCS temperatures:

- **IF** any RCP running,
THEN
CHECK T-avg stable at or trending to
between 547°F and 552°F.

OR

- **IF** RCPs stopped,
THEN
CHECK T-cold stable at or trending
to between 547°F and 552°F.

IF temperature less than 547°F
and dropping,

THEN

PERFORM the following:

- a. **ENSURE** steam dumps and
atmospheric reliefs **CLOSED**.
- b. **ENSURE** S/G blowdown isolation
valves **CLOSED**.
- c. **IF** cooldown continues,
THEN
PERFORM the following:
 - 1) **CONTROL** total feed flow
USING EA-3-8, Manual Control of
AFW Flow.
 - 2) **MAINTAIN** total feed flow
greater than 440 gpm
UNTIL narrow range level
greater than 10%
in at least one S/G.
 - 3) **DEPRESS RESET**
on MSR control panel.
 - 4) **IF** any MSR temp control valve
fails to close,
THEN
ISOLATE HP steam to MSRs.
- d. **IF** cooldown still continues,
THEN
CLOSE MSIVs and bypass valves.

IF temperature greater than 552°F
and rising,

THEN

- **DUMP** steam to condenser.
- OR**
- **DUMP** steam **USING** atmospheric
reliefs.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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4. MONITOR feedwater status:

a. T-avg less than 550°F.

a. GO TO Step 5.



b. MFW regulating valves CLOSED.

b. CLOSE valves.

c. MFW regulating bypass valve controller outputs ZERO.

c. CLOSE valves.

d. MFW isolation valves CLOSED.

d. CLOSE valves.

e. MFW pumps TRIPPED.

e. TRIP MFW pumps.

f. MFW flow ZERO.

f. CLOSE feedwater heater isolation MOVs as necessary.

OR

DISPATCH personnel to isolate MFW regulating and regulating bypass valves USING EA-3-12, Local Isolation of Main Feedwater.

g. Total feed flow to S/Gs greater than 440 gpm.

g. ESTABLISH AFW flow as necessary.

IF AFW flow CANNOT be established, THEN ESTABLISH main feedwater flow USING EA-2-2, Establishing Secondary Heat Sink Using Main Feedwater or Condensate System.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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5. **CHECK** if emergency boration is required:

a. **VERIFY** all control rods fully inserted:

- Rod bottom lights LIT
- Rod position indicators less than or equal to 12 steps.

a. **IF** any of the following conditions exists:

- two or more RPIs indicate greater than 12 steps

OR

- two or more control rod positions **CANNOT** be determined,

THEN

EMERGENCY BORATE

USING EA-68-4, Emergency Boration.

b. **MONITOR** RCS temperature:

- T-avg greater than 540°F if any RCP running

OR

- T-cold greater than 540°F if all RCPs stopped.

b. **EMERGENCY BORATE**

as necessary to maintain shutdown margin **USING EA-68-4, Emergency Boration.**

6. **ANNOUNCE** reactor trip **USING PA system.**

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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7. **MONITOR** pressurizer level control:

a. **CHECK** pressurizer level greater than 17%.

a. **PERFORM** the following:

- 1) **ENSURE** normal and excess letdown **ISOLATED**.
- 2) **ENSURE** pressurizer heaters **OFF**.
- 3) **CONTROL** charging to restore pressurizer level greater than 17%.
- 4) **WHEN** pressurizer level greater than 17%,
THEN
OPERATE pressurizer heaters as necessary.

b. **VERIFY** charging **IN SERVICE**.

b. **ESTABLISH** charging **USING** EA-62-5, Establishing Normal Charging and Letdown.

c. **VERIFY** letdown **IN SERVICE**.

c. **WHEN** charging established **AND** pwr level greater than 17%,
THEN
ESTABLISH letdown **USING** EA-62-5, Establishing Normal Charging and Letdown.

d. **CHECK** pressurizer level trending to 25% (normal range 20% to 30%).

d. **CONTROL** charging and letdown to maintain pressurizer level at 25% (normal range 20% to 30%).

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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8. **MONITOR** pressurizer pressure control:

- a. Pressurizer pressure greater than 1870 psig.

- a. **ENSURE** SI ACTUATED.

GO TO E-0, Reactor Trip or Safety Injection.



- b. Pressurizer pressure stable at or trending to 2235 psig (normal range 2210 psig to 2260 psig).

- b. IF pressure less than 2235 psig and dropping,
THEN
PERFORM the following:

- 1) **ENSURE** pressurizer PORVs CLOSED.

IF pressurizer PORV CANNOT be closed,
THEN
CLOSE its block valve.

- 2) **ENSURE** spray valves CLOSED.

IF spray valve(s) CANNOT be closed,
THEN
STOP RCPs #1 and 2.

IF pressurizer pressure continues to drop,
THEN
STOP additional RCP as necessary.

- 3) **ENSURE** all pressurizer heaters ON.

(step continued on next page)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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8. b. (continued)

IF pressure greater than 2235 psig
and rising,

THEN

PERFORM the following:

- 1) **ENSURE** all pressurizer heaters
OFF.
- 2) **CONTROL** pressure **USING** normal
spray.

IF normal spray **NOT** available
AND letdown in service,

THEN

CONTROL pressure **USING**
EA-62-4, Establishing Auxiliary
Spray.

IF normal spray **NOT** available
AND letdown **NOT** in service,

THEN

ENSURE pressure controlled
with pressurizer PORV(s).

9. **MAINTAIN** S/G narrow range levels:

a. Greater than 10%.

a. **MAINTAIN** total feed flow
greater than 440 gpm
UNTIL level greater than 10%
in at least one S/G.

b. Between 10% and 50%.

b. **IF** level in any S/G continues to rise,
THEN
ENSURE feed flow **STOPPED**
to that S/G.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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10. **VERIFY** AC busses **ENERGIZED**
from start busses.

PERFORM the following:

- a. **ENSURE** diesel generators supplying shutdown board loads as necessary:
 - CCPs
 - ERCW pumps.
 - AFW pumps.
 - Thermal barrier booster pumps.
 - CCS pumps.
 - Pressurizer heaters A-A and B-B.
- b. **ATTEMPT** to restore offsite power **USING** EA-202-1, Restoring Off-Site Power to 6900V Shutdown Boards.
- c. **ENSURE** control air compressors A and B started **USING** EA-32-2, Establishing Control and Service Air.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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CAUTION Arming steam dumps in pressure mode with demand signal present could result in rapid RCS cooldown.

11. **DETERMINE** if steam dump to condenser available:

a. **CHECK** condenser AVAILABLE:

- C-9 CONDENSER INTERLOCK permissive LIT [M-4A, E6]
- At least one Intact S/G MSIV OPEN.

a. **USE** atmospheric reliefs in AUTO and set for 84% (1005 psig).

IF atmospheric reliefs NOT functioning in AUTO,
THEN
USE manual control of atmospheric reliefs.

IF local control of atmospheric reliefs is necessary,
THEN
DISPATCH personnel to dump steam **USING** EA-1-2, Local Control of S/G PORVs.

GO TO Note prior to Step 12.



b. **PLACE** steam dumps in STEAM PRESS mode:

- 1) **PLACE** steam dumps in OFF.
- 2) **ENSURE** steam dumps in steam pressure mode.
- 3) **ENSURE** zero output (demand).
- 4) **PLACE** steam dumps in ON.
- 5) **ADJUST** steam dump controller setpoint to 84% (1005 psig) in AUTO.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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NOTE Loop 2 RCP and associated spray valve will provide adequate spray flow for RCS pressure control. If Loop 2 is not available, all three remaining RCPs may be required to ensure adequate spray flow.

12. **CHECK RCP #2 RUNNING.**

PERFORM the following:

- a. IF NO RCPs running,
 THEN
 ENSURE all RCS dilution
 STOPPED.
- b. **ATTEMPT** to start RCP(s)
 to provide normal pwr spray:
 - 1) **ESTABLISH** conditions for
 starting RCP(s) **USING** EA-68-2,
 Establishing RCP Start
 Conditions.
 - 2) IF RCP start conditions
 established,
 THEN
 START RCP #2 (if available)
 OR RCPs #1, 3, and 4.

IF NO RCP can be started,
THEN
MONITOR natural circulation
USING EA-68-6, Monitoring
Natural Circulation Conditions.

IF natural circulation
CANNOT be verified,
THEN
RAISE steam dump rate.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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13. **MONITOR** if source range channels should be reinstated:

a. **CHECK** intermediate range flux less than 10^{-4} % power on operable channels.

a. **GO TO** Step 14.



b. **CHECK** source range channels **REINSTATED**.

b. **REINSTATE** source range channels by simultaneously placing both SRM TRIP RESET-BLOCK switches to RESET position. [M-4]

c. **SELECT** one SRM and one IRM on NR-45 recorder.

d. **ENSURE** audio count rate operation.

e. **RESET** shutdown monitor alarm setpoints. [M-13]

f. **WHEN** shutdown monitor ALARM LEDs dark **AND** HIGH FLUX AT SHUTDOWN bistable lights dark, **THEN** **PLACE** HIGH FLUX AT SHUTDOWN alarm block switches in NORMAL. [M-13]

SQN	REACTOR TRIP RESPONSE	ES-0.1 Rev. 30
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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14. **SHUT DOWN** unnecessary plant equipment:

- **REFER TO** 0-GO-12, Realignment Of Secondary Equipment Following Reactor/Turbine Trip.

15. **MAINTAIN** stable plant conditions:

- Pressurizer pressure at 2235 psig
(normal range 2210 psig to 2260 psig)
- Pressurizer level at 25%
(normal range 20% to 30%)
- S/G narrow range levels
between 10% and 50%
- RCS temperature at 547°F
(between 540°F and 550°F):
 - T-avg if any RCP running
 - OR
 - T-cold if all RCPs stopped.

16. **PERFORM** EA-0-9, Post Trip Administrative Requirements and Recovery Actions.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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17. **DETERMINE** if natural circulation
cooldown is required:

a. **CHECK** at least one RCP RUNNING.

a. **IF** plant cooldown required
with NO RCP available,
THEN
GO TO ES-0.2, Natural Circulation
Cooldown.



DO NOT CONTINUE this procedure
UNTIL at least one RCP restarted.

b. **CHECK** at least one AFW pump
AVAILABLE.

b. **DO NOT CONTINUE** this procedure
UNTIL at least one AFW pump
AVAILABLE.

c. **SELECT** appropriate procedure:

- 0-GO-6, Power Reduction from
30% Reactor Power to Hot
Standby (if maintaining hot
standby)
- OR
- 0-GO-7, Unit Shutdown from Hot
Standby to Cold Shutdown
- OR
- other appropriate procedure
as determined by Shift Manager
or TSC (if manned).

d. **GO TO** appropriate plant procedure.



END