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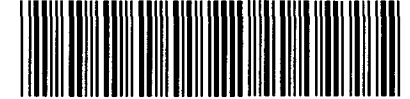
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Information
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CRYSTAL RIVER UNIT 3
PLANT OPERATING MANUAL

EMERGENCY PLAN IMPLEMENTING PROCEDURE

EM-225A

POST ACCIDENT RB HYDROGEN CONTROL

REVISION 10

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1.0 PURPOSE

1. This procedure provides guidance for the Accident Assessment Team (AAT) and other emergency response personnel in developing appropriate actions to monitor and control post-accident hydrogen concentration in the Reactor Building (RB) to protect the health and safety of the general public and Crystal River Energy Complex personnel during an emergency at CR-3.
2. This procedure is an emergency plan implementing procedure. Any revisions to this procedure must be carefully considered for emergency plan impact.

2.0 REFERENCES

2.1 Developmental References

1. FSAR Chapter 14 Appendix B
2. MAR 91-05-03-01, "Hydrogen Purge Redundancy Restoration"
3. MAR 93-05-03-02, "Hydrogen Purge Redundancy Restoration, Elect. & I&C"
4. CALC M-99-0051, "Mission Dose Assessment"
5. CALC I-90-0013, "Post Accident Reactor Building Hydrogen Purge Flow Accuracy"
6. CALC M-90-0056, "Hydrogen Mini Purge Pressure Loss"
7. CALC M-99-0052, "Zone Environmental Radiation Dose for LOCA"
8. CALC N-00-0002, "Public And Control Room Dose From A LOCA Using The Alternative Source Term"
9. CALC M-85-1004, "H2 Generation Rate"
10. CALC I-90-0023, "RB Hydrogen Concentration Loop Accuracy"

2.2 Implementing References

1. EOP-14, Emergency Operating Procedure Enclosures
2. MP-815, Installation of Post Accident Hydrogen Purge Monitors
3. EM-104, Operation of the Operational Support Center

3.0 DEFINITIONS

1. **Off-shore winds:** Winds originating from NNE to ESE sectors (011° to 124°). The most common time for this to occur is midnight.

4.0 RESPONSIBILITIES

1. Emergency Coordinator (EC) or designee:
 - Approves RB purge before initiation (Enclosure 6, Purge Release Authorization Form).
 - Ensures coordination with off-site agencies before initiation of RB purges.
2. Accident Assessment Team:
 - Tracks RB conditions and predicts time for RB purge initiation.
 - Monitors the effectiveness of purge methods in hydrogen removal.
 - Informs the EC of RB conditions and the status of pre-planned releases
 - Assign a Purge Release Authorization Form number (Enclosure 6, Purge Release Authorization Form).
3. Dose Assessment Team:
 - Monitors meteorological conditions and predicts when off-shore winds should exist.
 - Projects off-site doses for proposed RB purges.
4. Procurement Representative:
 - Ensures required air compressors are delivered on-site within the required time.
 - Ensures support materials (fuel, oil, etc.) are available to support portable compressor operations.
5. Emergency Repair Team:
 - Connects temporary air compressors when delivered.
 - Installs LR-82-FE, LR-83-FE, LR-82-FI, and LR-83-FI in accordance with MP-815, Installation of Post Accident Hydrogen Purge Monitors.
6. Radiation Monitoring Team:
 - Evaluates actual plant radiological conditions and determine routes to be used (see Enclosure 9, Access Routes).
7. Operations:
 - Performs RB purge per Enclosure 7, Purging RB.

5.0 PREREQUISITES

None

6.0 PRECAUTIONS, LIMITATIONS, AND NOTES

1. All hydrogen concentration values referenced in this procedure are presented in % by volume as indicated on the hydrogen analyzers.
2. Maintain RB hydrogen concentration < 3.6% to provide adequate margin below the lower flammability limit of 4.1% for hydrogen in air.
3. Travel through radiation areas should be as shown in Enclosure 9, Access Routes, unless otherwise directed by the emergency RWP.
4. Purging should be performed under favorable meteorological conditions (off-shore winds) whenever possible.
5. RB pressure must be carefully controlled during purge evolutions to prevent ES actuations from high RB pressure.
6. The purging criteria established by this procedure is not valid during Severe Accidents.
7. Mission dose calculations credit 10 days of radioactive decay when determining the dose received for performance of local actions. Taking local actions before this time may result in excessive radiation exposure.
8. If a predictable pattern of off-shore winds is identified, consideration should be given to performing a series of intermittent releases during periods when off-shore winds are present.
9. The AAT is responsible for overall implementation of this procedure. TSC teams responsible for performing the specific actions listed in the enclosures of this procedure are denoted at the end of each step as applicable.
10. Hydrogen is a flammable and explosive gas. Care must be taken to ensure ignition source are not in the immediate area where potential for explosive hydrogen concentrations exists. This will minimize the potential for personnel injury and equipment damage.

7.0 SPECIAL TOOLS AND EQUIPMENT

1. Air Compressors (as needed)

8.0 ACCEPTANCE CRITERIA

None

9.0 INSTRUCTIONS

NOTE: Enclosure 11, Hydrogen Purge System Flow Diagram, depicts the hydrogen Purge flow paths established by this procedure. Enclosure 11, Hydrogen Purge System Flow Diagram, is provided for information only.

1. If RCS LOCA conditions exist, then monitor RB hydrogen concentration in accordance with Enclosure 1, Hydrogen Monitoring, of this procedure.
2. If at any time RB hydrogen concentration $\geq 1\%$, then perform the following:
 - Perform Enclosure 2, Preparations for RB Hydrogen Purge, in this procedure.
 - Notify Procurement Representative to contact Hydrogen Recombiner vendor to coordinate preliminary transportation plan and schedule for delivery of recombinder. Refer to EM-104, Operation of the Operational Support Center.
 - RMT/AAT evaluate plant conditions and equipment availability to determine if a Hydrogen Recombiner will be required. Notify Procurement Representative if recombinder is required.
3. When at any time RB purge compressors arrive on site, and radiological conditions permit, then perform Enclosure 3, Portable Compressor Installation, of this procedure.
4. When RB hydrogen concentration $\geq 3.3\%$, and radiological conditions permit, then perform Enclosure 4, Prerequisite Field Actions, of this procedure.
5. When RB hydrogen concentration $\geq 3.4\%$, then perform Enclosure 5, RB Pressurization for Hydrogen Purge, of this procedure.
6. When RB hydrogen concentration $\geq 3.5\%$, then begin Enclosure 6, Purge Release Authorization Form, of this procedure.
7. When any of the following conditions exist, then perform Enclosure 7, Purging RB, of this procedure:
 - RB H₂ concentration $\geq 3.5\%$ for ≥ 24 hours
 - RB H₂ concentration $\geq 3.5\%$ and off shore winds exist
 - RB H₂ concentration $\geq 3.6\%$,
8. When RB purge is stopped, then go to Step 9.0.6 or this procedure.

10.0 RECORDS

All enclosures are quality records.

HYDROGEN MONITORING

STATUS

- LOCA Conditions Exist

ACTIONSDETAILS

- 1.1 ☐ Ensure one H₂ analyzer is aligned and placed in service (Ops).

- ☐ Ensure applicable steps of EOP-14, Enclosure 2, PPO Post Event Actions, have been completed for H₂ analyzers.

- 1.2 ☐ Plot RB H₂ concentration on Enclosure 8, RB Hydrogen Concentration Trend of this procedure (AAT).

- Obtain H₂ concentrations from either of the following:

☐ EOP-14, Enclosure 21, RB Hydrogen Monitor Log.

☐ RECALL

- 1.3 ☐ Project when RB H₂ concentration will exceed action levels of this procedure (AAT).

- ☐ Use H₂ concentration plotted on Enclosure 8, RB Hydrogen Concentration Trend of this procedure.
- ☐ Extrapolate to estimate time when H₂ concentration will reach procedure action levels.

| <u>Action Level</u> | <u>Date</u> | <u>Time</u> |
|-----------------------|----------------------|----------------------|
| H ₂ ≥ 1% | <input type="text"/> | <input type="text"/> |
| H ₂ ≥ 3.3% | <input type="text"/> | <input type="text"/> |
| H ₂ ≥ 3.4% | <input type="text"/> | <input type="text"/> |
| H ₂ ≥ 3.5% | <input type="text"/> | <input type="text"/> |
| H ₂ ≥ 3.6% | <input type="text"/> | <input type="text"/> |

HYDROGEN MONITORING

ACTIONS

DETAILS

- 1.4 IF at anytime H₂ concentration is \geq an action level of this procedure, THEN immediately notify the Accident Assessment Team Coordinator (AAT).

- Action levels based on RB H₂ concentrations.

| <u>Action Level</u> | <u>Required Action</u> |
|----------------------------|------------------------|
| H ₂ \geq 1% | See step 9.0.2 |
| H ₂ \geq 3.3% | See step 9.0.4 |
| H ₂ \geq 3.4% | See step 9.0.5 |
| H ₂ \geq 3.5% | See step 9.0.6 |

- 1.5 Continue monitoring RB H₂ concentration (AAT).

- Plot RB H₂ concentration on Enclosure 8, RB Hydrogen Concentration Trend of this procedure every 8 hours.
- Perform Step 1.3 of this Enclosure every 8 hours.

PREPARATIONS FOR RB HYDROGEN PURGE

STATUS

- RB H₂ Concentration \geq 1%

ACTIONSDETAILS

- | | | | |
|-------|---|---|---|
| 1.1 | — | Notify the Procurement Representative, Radiation Controls Coordinator, Repairs Coordinator and Control Room to begin preparations for RB purge. | <ul style="list-style-type: none"> • Review this procedure for: <ul style="list-style-type: none"> — Procurement of tools and equipment. — Selection of emergency team personnel. — Assigning Operations support to the OSC. — Initiation of reentry process per <u>EM-104</u>. — Collection of radiological and meteorological data. — Review of dose projection process. |
| <hr/> | | | |
| 1.2 | — | Evaluate plant radiological conditions and determine routes to be used to perform Enclosures 2, 3, 4, 5, and 7 (RMT). | <ul style="list-style-type: none"> • Refer to Enclosure 9, Access Routes for locations of required actions/components and suggested routes. |
| <hr/> | | | |
| 1.3 | — | Notify off-site sources to obtain portable air compressors (Procurement Representative). | <ul style="list-style-type: none"> • Obtain 3 or more air compressors from one of the following off-site sources: <ul style="list-style-type: none"> — Compressed Air Systems, Telephone (800) 626-8177 <u>OR</u> (813) 626-8177 (Tampa) — Air Components & Equipment, Inc., Telephone (813) 621-3087 (Tampa) • — Obtain air compressors capable of 225 scfm minimum each for continuous purge (rated exhaust flow) and rated discharge TEMP < 150°F. |
| <hr/> | | | |
| 1.4 | — | Ensure all CCHE habitability breaches are sealed (ERT). | |

PREPARATIONS FOR RB HYDROGEN PURGE

ACTIONS

DETAILS

-
- | | |
|---|--|
| 1.5 <input type="checkbox"/> Monitor meteorological conditions to predict off-shore wind cycle (DAT). | <ul style="list-style-type: none">• <input type="checkbox"/> Off-shore winds originate from NNE to SE sectors (011.2° to 146.3°).• <input type="checkbox"/> Most common time for off-shore winds is midnight. |
|---|--|
-
- | | |
|--|--|
| 1.6 <input type="checkbox"/> Ensure the purge flow instrumentation cart is properly staged and equipped (ERT). | <ul style="list-style-type: none">• <input type="checkbox"/> Refer to <u>MP-815</u> for location of equipment.• <input type="checkbox"/> DO NOT install purge instruments until Enclosure 4, Prerequisite Field Actions is performed. |
|--|--|
-
- | | |
|---|--|
| 1.7 <input type="checkbox"/> Ensure power is available to LR-82-FI and LR-83-FI receptacle (OPS). | <ul style="list-style-type: none">• <input type="checkbox"/> RX MCC 3B2 is energized.• <input type="checkbox"/> RX MCC 3B2, BKR 8AR closed.• <input type="checkbox"/> ACDP-20, BKR 12 closed. (143 ft AB near elevator) |
|---|--|
-
- | | |
|--|--|
| 1.8 <input type="checkbox"/> Notify the Accident Assessment Team Coordinator that Enclosure 2, Preparations for RB Hydrogen Purge is complete (AAT). | |
|--|--|
-

PORTABLE COMPRESSOR INSTALLATION

STATUS

- Purge Compressors Are On Site
- Hydrogen Concentration $\geq 1\%$

ACTIONSDETAILS

- 1.1 ____ Consult Radiation Monitoring Team to determine routes and precautions to be used during compressor installation (ERT).

- Refer to Enclosure 9, Access Routes for locations of required actions/components and suggested routes.

- 1.2 ____ Connect portable air compressors (ERT).

- ____ DO NOT open LRVs at this time.
- ____ Indicate LRVs to which portable air compressors are connected.
- ____ Preferred - RB portable compressor connections (119 ft IB outside west wall):

| | |
|-------------|-------------|
| ____ LRV-11 | ____ LRV-16 |
| ____ LRV-12 | ____ LRV-17 |
| ____ LRV-13 | ____ LRV-18 |
| ____ LRV-14 | ____ LRV-19 |
| ____ LRV-15 | ____ LRV-20 |

- ____ Alternate - H₂ recombiner connections (119 ft IB outside west wall): (adapters in stores – CAT ID # 0001260356)

| |
|-----------------------|
| ____ LRV-92 (Pen 125) |
| ____ LRV-90 (Pen 121) |
| ____ LRV-94 (Pen 125) |
| ____ LRV-88 (Pen 122) |

PORTABLE COMPRESSOR INSTALLATION

ACTIONS

DETAILS

- 1.3 ____ Ensure plant personnel are familiar with the operation of the portable compressors (OPS/ERT).

-
- 1.4 ____ Obtain support materials for portable compressors (Procurement Representative).

- ____ Determine portable compressor fuel and oil consumption rate from compressor vendor.
- ____ Ensure sufficient fuel and oil supplies are available to support compressor operation.

-
- 1.5 ____ Notify the Accident Assessment Team Coordinator that Enclosure 3, Portable Compressor Installation is complete (OPS/ERT).

PREREQUISITE FIELD ACTIONS

STATUS

- RB H₂ Concentration \geq 3.3%

ACTIONSDETAILS

- | | | | |
|-------|---|---|---|
| 1.1 | — | Consult Radiation Monitoring Team to determine routes and precautions to be used while performing RB Purge Field Actions (ERT). | <ul style="list-style-type: none"> • Refer to Enclosure 9, Access Routes for locations of required actions/components and suggested routes. |
| <hr/> | | | |
| 1.2 | — | Defeat all starting interlocks on AHF-7A and 7B (OPS). | <ol style="list-style-type: none"> 1. — Obtain key 92 from the Control Room. 2. Select RB exhaust fan permissive bypass switches to the "Emergency" position (119 ft IB East Door) <ul style="list-style-type: none"> • — AHF-7A, Ventilation MCC 3A-10C • — AHF-7B, Ventilation MCC 3B-9C |
| <hr/> | | | |
| 1.3 | — | Open RB exhaust dampers for emergency operation (OPS). | <ul style="list-style-type: none"> • — Select AHV-77 to the "EMERGENCY OPERATION OF AHD-95, AHD-96, AND AHD-94" position. (143 ft AB Ventilation Equipment Area, HVAC-13) • — Select AHV-78 to the "EMERGENCY OPERATION OF AHD-97, AHD-98, AND AHD-94" position. (143 ft AB Ventilation Equipment Area, HVAC-13) |

PREREQUISITE FIELD ACTIONS

| <u>ACTIONS</u> | <u>DETAILS</u> |
|---|---|
| 1.4 ___ Ensure RM-A1 is in service (OPS/DAT). | <ul style="list-style-type: none">• ___ Ensure RM-A1 pump is running with path to and from pump (143 ft AB).• ___ Ensure RM-A1 monitors have power aligned.• ___ Ensure the following MCB annunciator links are closed:<ul style="list-style-type: none">___ 1712___ 1713___ 1714• ___ Adjust RM-A1 gas channel "HIGH" alarm setting potentiometer to maximum (clockwise).• ___ Ensure LMH controller associated with RM-A1 is in "AUTO". |
| 1.5 ___ Notify Repairs Coordinator to obtain and install flow instrumentation (ERT). | <ul style="list-style-type: none">• ___ CONCURRENTLY PERFORM <u>MP-815</u>, Installation of Post Accident H₂ Purge Flow Instruments. |
| 1.6 ___ <u>WHEN</u> H ₂ Purge Flow Instruments are installed <u>THEN</u> notify the Accident Assessment Team Coordinator that Enclosure 4, Prerequisite Field Actions is complete (OPS/ERT). | |

RB PRESSURIZATION FOR HYDROGEN PURGE

STATUS

- RB H₂ Concentration \geq 3.4%
- Portage Air Compressors are installed.

ACTIONSDETAILS

- 1.1 ____ Consult Radiation Monitoring Team to determine routes and precautions to be used while performing RB Pressurization (ERT).

- Refer to Enclosure 9, Access Routes for locations of required actions/components and suggested routes.

- 1.2 ____ IF portable air compressors were connected to RB portable compressor connections, THEN start air supply to RB and establish and maintain RB PRESS at \approx 2 psig (ERT/Ops).

- 1 ____ Start portable air compressors.
- 2 Open isolation valves for operating air compressors (119 ft IB west door):

| | |
|-------------|-------------|
| ____ LRV-11 | ____ LRV-16 |
| ____ LRV-12 | ____ LRV-17 |
| ____ LRV-13 | ____ LRV-18 |
| ____ LRV-14 | ____ LRV-19 |
| ____ LRV-15 | ____ LRV-20 |

- 3 ____ Unlock and open LRV-36 "AIR SUPPLY TO PENETRATION 121 ISO" (119 ft IB south of A MSSVs).
- 4 ____ Unlock and open LRV-50 "PENETRATION 121 ISO" (119 IB ft south of PZR Htr MCC 3B overhead).
- 5 ____ Adjust LRV-26 "LRV-24 BYPASS" (119 ft IB south of A MSSVs) to maintain RB PRESS at \approx 2 psig.

RB PRESSURIZATION FOR HYDROGEN PURGE

ACTIONS

- 1.3 ____ IF portable air compressors were connected to H₂ recombiner connections, THEN start air supply to RB and establish and maintain RB PRESS at \approx 2 psig (ERT/Ops).

DETAILS

- 1 ____ Start portable air compressors.
- 2 Open H₂ recombiner connection isolations for operating air compressors (119 ft IB):

| | |
|----------------------|----------------------|
| ____ LRV-87 (unlock) | ____ LRV-88 (unlock) |
| ____ LRV-89 (unlock) | ____ LRV-90 (unlock) |
| ____ LRV-91 (unlock) | ____ LRV-92 (unlock) |
| ____ LRV-93 (unlock) | ____ LRV-94 (unlock) |

- 3 ____ Adjust the compressor output to establish and maintain RB PRESS at \approx 2 psig.

-
- 1.4 ____ WHEN RB PRESS is being maintained at \approx 2 psig, THEN notify the Accident Assessment Team Coordinator that Enclosure 5, RB Pressurization for Hydrogen Purge is complete (OPS/ERT).

PURGE RELEASE AUTHORIZATION FORM

PRAF # _____

COMPLETED BY THE ACCIDENT ASSESSMENT TEAM:

- 1) Date/Time accident started: _____ / _____
- 2) Projected Date/Time for purge start: _____ / _____
- 3) Time after accident for purge start: _____ (hrs) [1 minus 2]
- 4) Error Corrected Flowrate based on time after accident (see Enclosure 10) _____ (scfm)

Completed By: _____ Date: _____

COMPLETED BY THE DOSE ASSESSMENT TEAM:Containment Atmosphere Activity ($\mu\text{Ci/cc}$): _____

Meteorological Conditions used in projection:

Wind Direction _____ Wind Speed _____ Stability Class _____

Projected purge duration = 1440 minutes (1 day)

RADDose-IV Projected Dose (REM) based on Error Corrected Flow rate:

Site Boundary _____ 2 miles _____ 5 miles _____ 10 miles _____

RADDose-IV Projected Curies to be released: Noble Gas _____ Iodine _____

Completed By: _____ Date: _____

COMPLETED BY EMERGENCY COORDINATOR:

EOF Director notified: _____

EOF Director notified: Date/Time _____ / _____

Ensure the EOF Director has coordinated with the State and local government officials before initiating purge.

EMERGENCY COORDINATOR APPROVAL _____ / _____
Sign/Date

PURGING RB

STATUS

- RB Purge Is Required

ACTIONSDETAILS

- 1.1 ____ Ensure Enclosure 2, 3, 4, and 5 of this procedure have been completed (AAT).

- ____ Enclosure 2, Preparations for RB Hydrogen Purge complete
- ____ Enclosure 3, Portable Compressor Installation complete
- ____ Enclosure 4, Prerequisite Field Actions complete
- ____ Enclosure 5, RB Pressurization for Hydrogen Purge complete

- 1.2 ____ Determine required purge flow rate (AAT/DAT).

- ____ IF H₂ purge has been previously performed, THEN use flows from previous purge.
- ____ IF H₂ purge has NOT been previously performed, THEN refer to Enclosure 10, Continuous Purge Flow Rates after a LOCA to determine flows:
 ____ Required Purge Flow ____ scfm
 ____ Error Corrected Flow ____ scfm
- ____ Record Error Corrected Flow on Enclosure 6, Purge Release Authorization Form.

- 1.3 ____ Consult Radiation Monitoring Team to determine routes and precautions to be used while performing RB Pressurization (ERT).

- Refer to Enclosure 9, ACCESS ROUTES for locations of required actions/components and suggested routes.

- 1.4 ____ WHEN Enclosure 6, Purge Release Authorization Form is complete and approved by the EC, THEN continue with this enclosure.

PURGING RB

STATUS

- EC has approved Purge Release Authorization Form, Enclosure 6

ACTIONSDETAILS

- 1.5 ☐ Notify the EC and the EOF Director that RB hydrogen purge is commencing (AAT).

- 1.6 ☐ Start RB purge Exhaust fan (OPS).

- Start at least one RB Exhaust fan:

☐ AHF-7A

☐ AHF-7B

- 1.7 ☐ IF RB purge has previously been performed, THEN open purge isolation valves associated with the previously adjusted throttle valve (OPS).

- IF LRV-121 was previously throttled THEN Open A Train isolation valves.

☐ LRV-70

☐ LRV-71

- IF LRV-123 was previously throttled THEN Open B Train isolation valves.

☐ LRV-72

☐ LRV-73

PURGING RB

ACTIONSDETAILS

- 1.8 ____ IF purge has NOT previously been performed, THEN establish required RB purge flow (OPS).

- 1 ____ Record "Required Purge Flow" from Step 1.2 of this enclosure.
 - Required Purge Flow ____ scfm
- 2 ____ IF A Train purging is desired, THEN perform the following in order:
 - ____ Open LRV-70
 - ____ Open LRV-71
 - ____ Throttle LRV-121 to obtain "Required Purge Flow" on flow indicator LR-82-FI (143 ft AB Ventilation Room).
 - ____ Record reading from LR-82-FI
____ scfm
- 3 ____ IF B Train purging is desired, THEN perform the following in order:
 - ____ Open LRV-72
 - ____ Open LRV-73
 - ____ Throttle LRV-123 to obtain "Required Purge Flow" on flow indicator LR-83-FI (143 ft AB Ventilation Room).
 - ____ Record reading from LR-83-FI
____ scfm

- 1.9 ____ Maintain RB PRESS constant at ≈ 2 psig (OPS).

- ____ IF portable air compressors were connected to RB portable compressor connections, THEN adjust LRV-26 "AIR SUPPLY TO PENETRATION 121 CONTROL BYPASS" (119 ft IB south of A MSSVs) to maintain RB PRESS at ≈ 2 psig.
- ____ IF portable air compressors were connected to H₂ recombiner connections, THEN adjust the compressor output to maintain RB PRESS at ≈ 2 psig.

PURGING RB

ACTIONSDETAILS

- 1.10 ____ WHEN all of the following exist:

____ RB H₂ Concentration is
 $\leq 3.5\%$
 ____ EC approves
 termination

THEN stop RB purge
 (OPS/ERT).

- 1 Ensure the following valves are closed:

| A Train | B Train |
|-------------|-------------|
| ____ LRV-70 | ____ LRV-72 |
| ____ LRV-71 | ____ LRV-73 |

- 2 Ensure RB exhaust fans are stopped:

____ AHF-7A
 ____ AHF-7B

- 3 ____ IF portable air compressors are connected to RB portable compressor connections, THEN close the following valves:

____ LRV-50
 "PENETRATION 121 ISO"
 (119 ft IB south of
 PZR Htr MCC 3B overhead)

____ LRV-36
 "AIR SUPPLY TO
 PENETRATION 121 ISO"
 (119 ft IB south of A MSSVs)

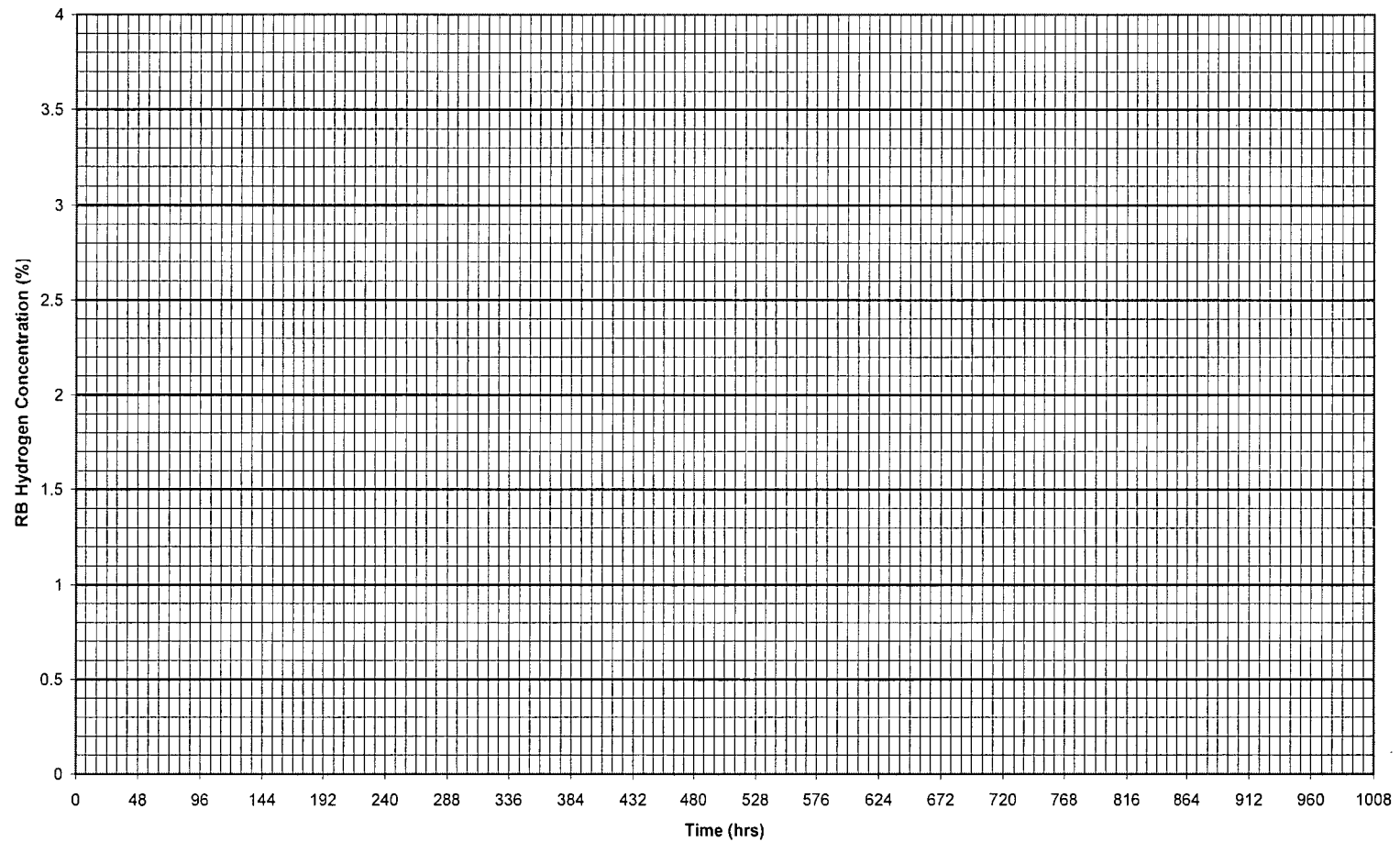
- 4 ____ IF portable air compressors are connected to H₂ recombiner connections, THEN close the following valves:

| | |
|-------------|-------------|
| ____ LRV-87 | ____ LRV-88 |
| ____ LRV-89 | ____ LRV-90 |
| ____ LRV-91 | ____ LRV-92 |
| ____ LRV-93 | ____ LRV-94 |

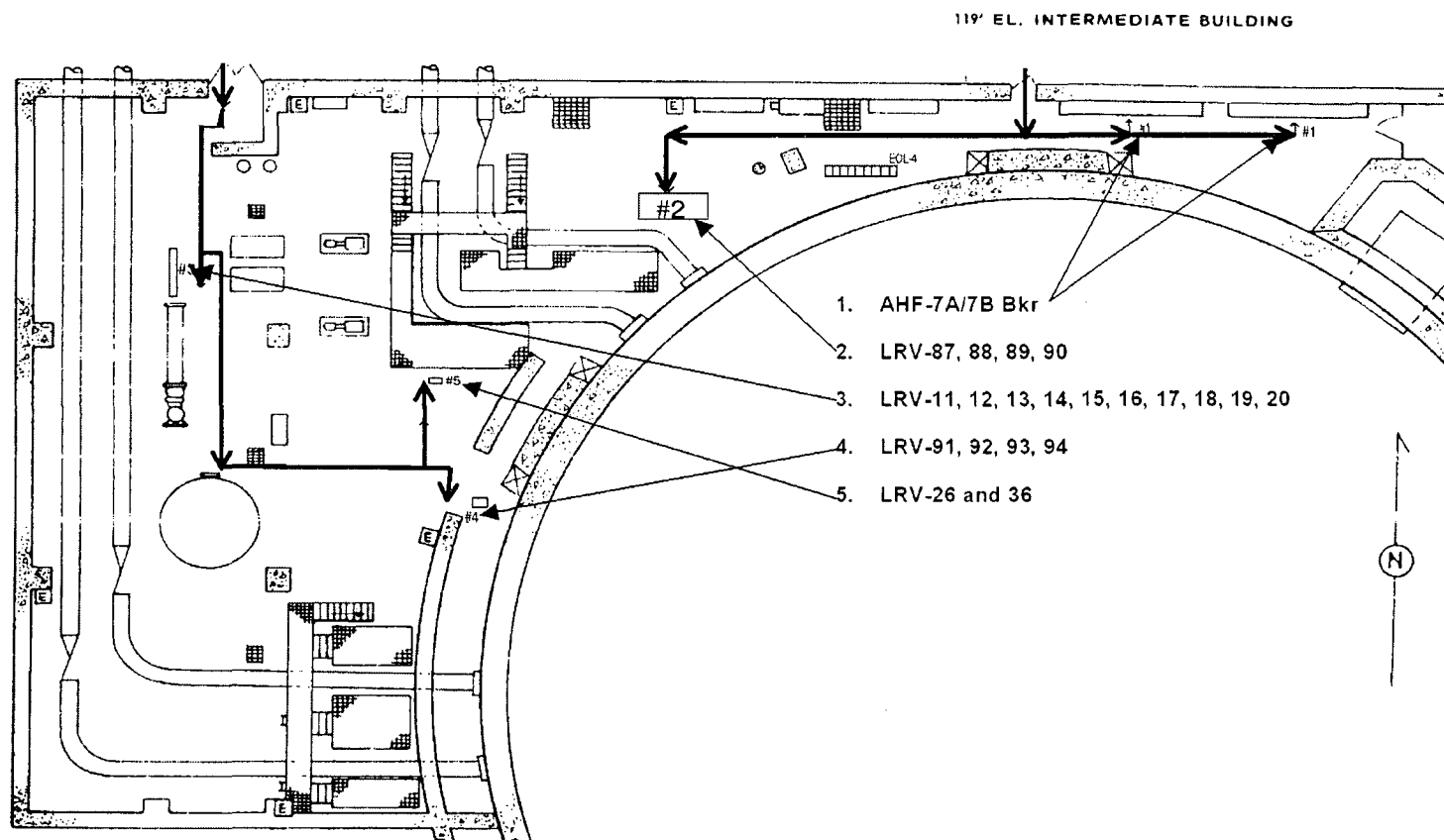
- 5 ____ Stop portable air compressors.

- 1.11 ____ Notify the Accident Assessment Team Coordinator that RB purge is secured.

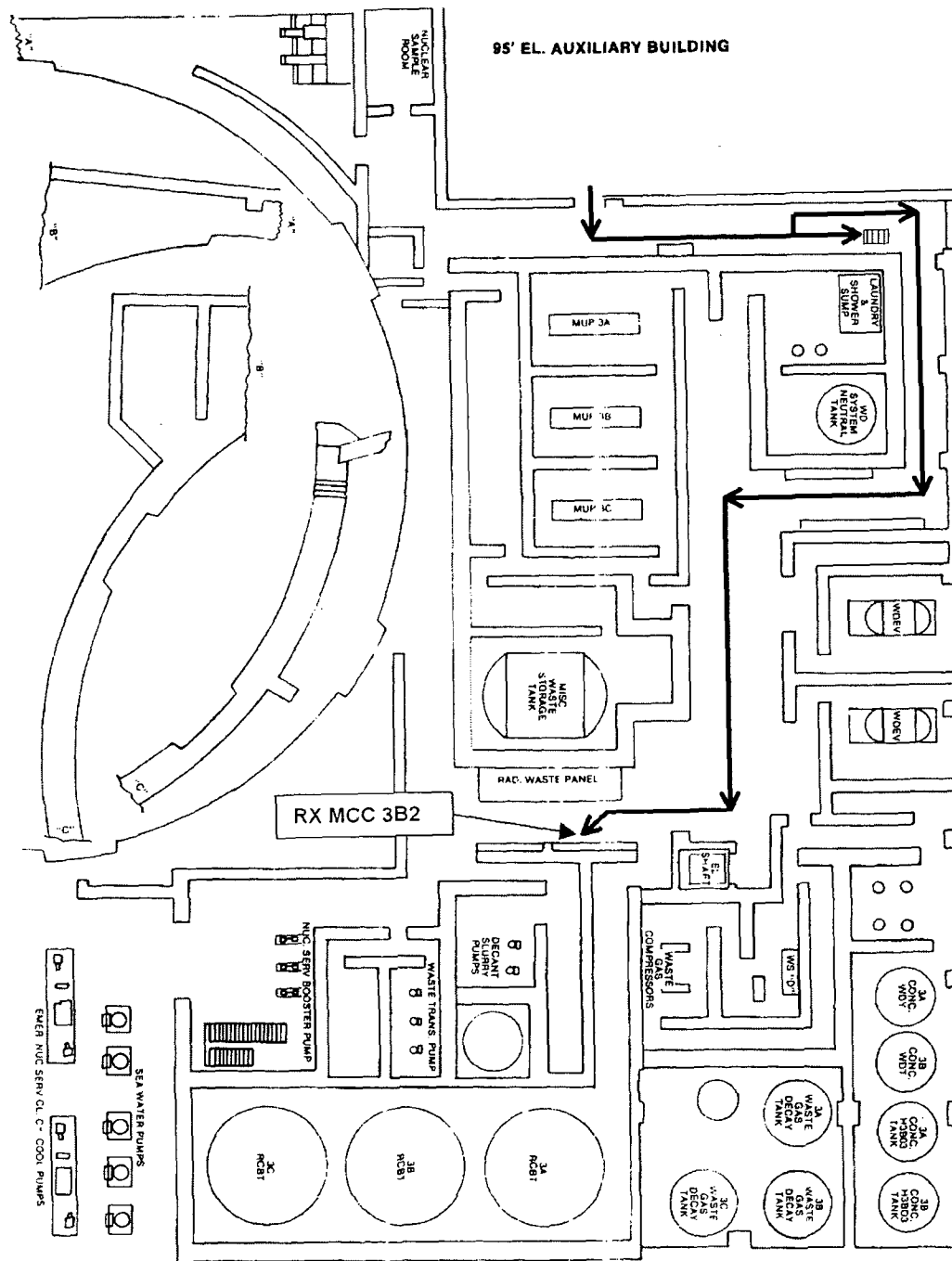
RB HYDROGEN CONCENTRATION TREND



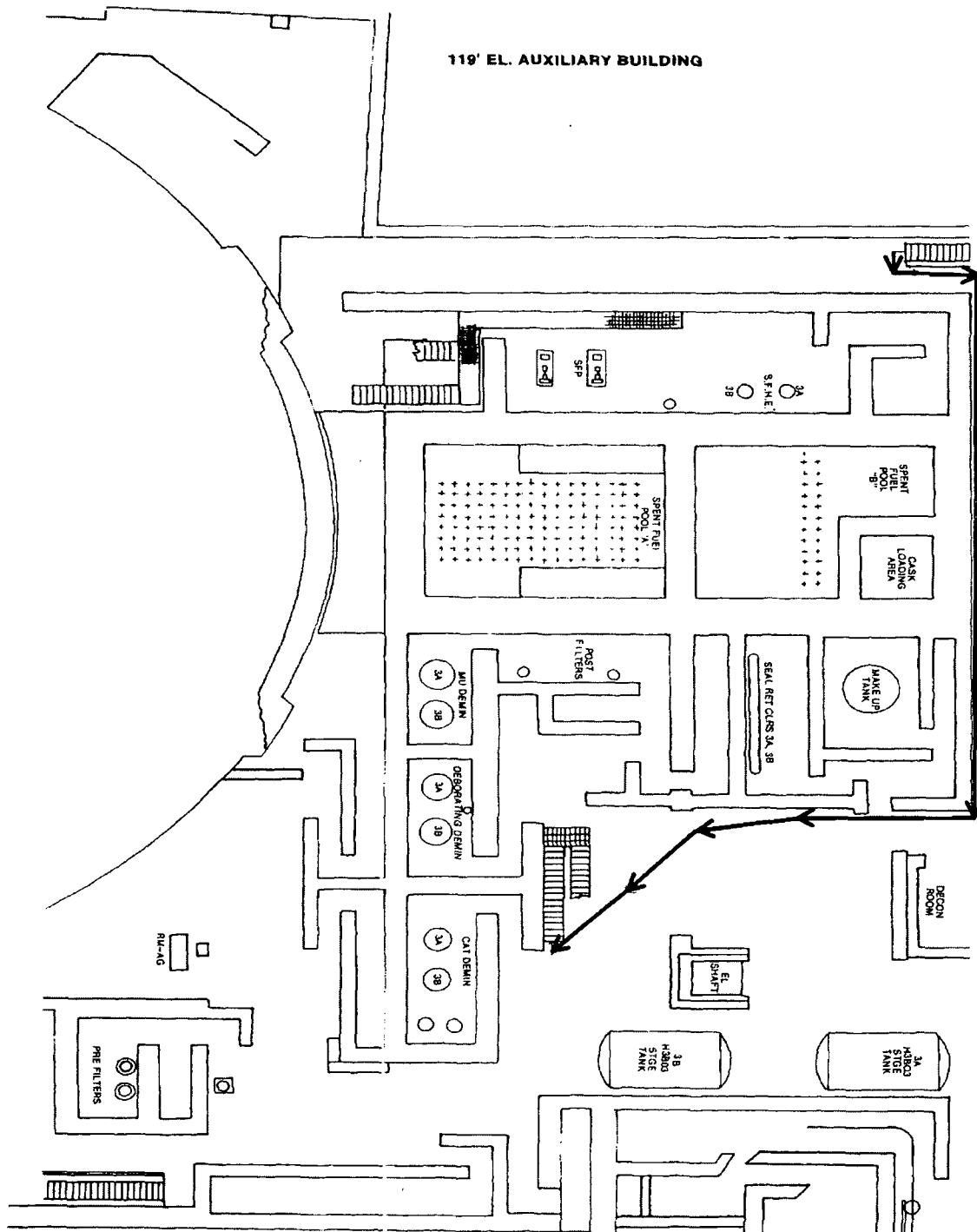
ACCESS ROUTES



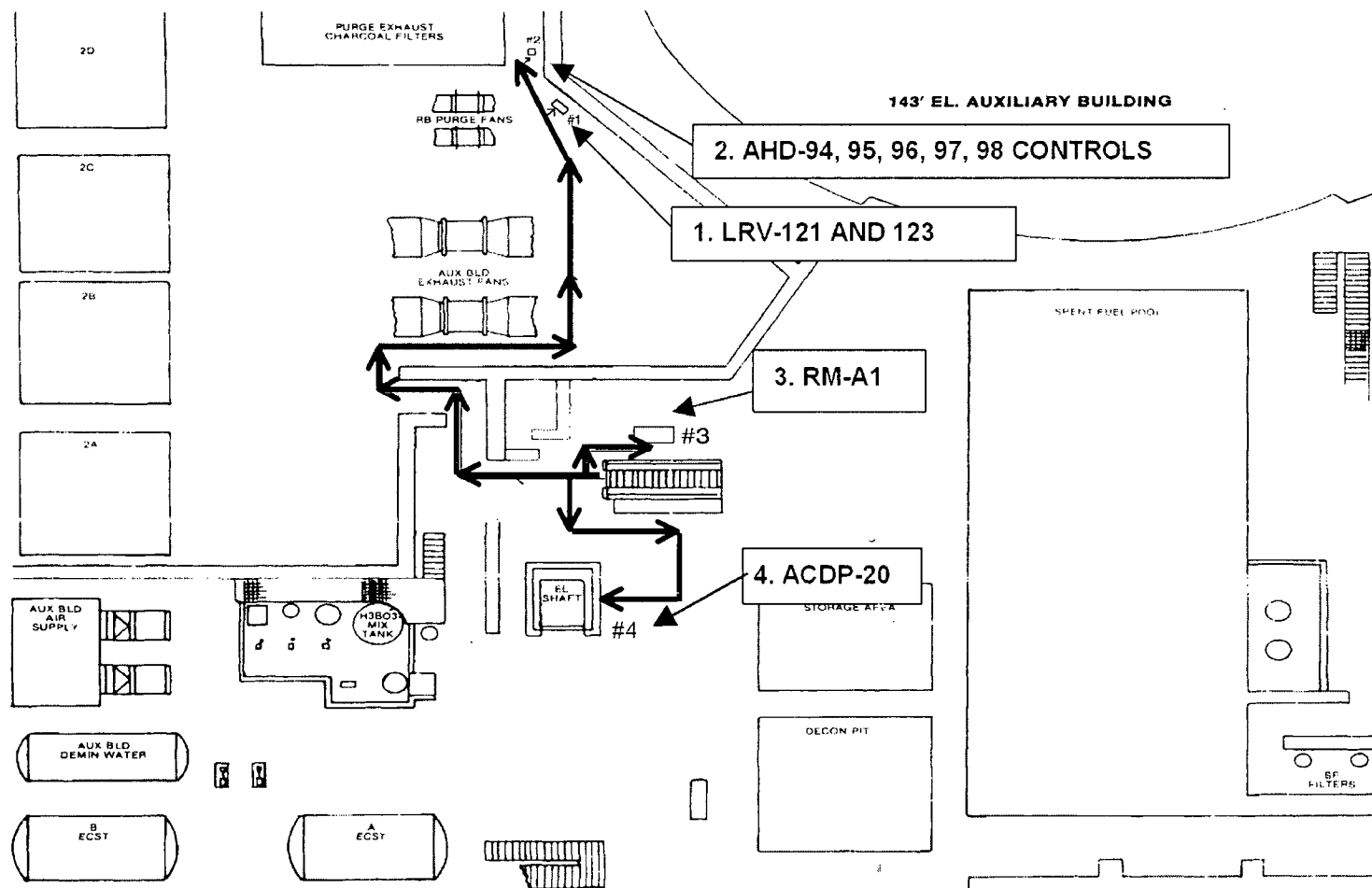
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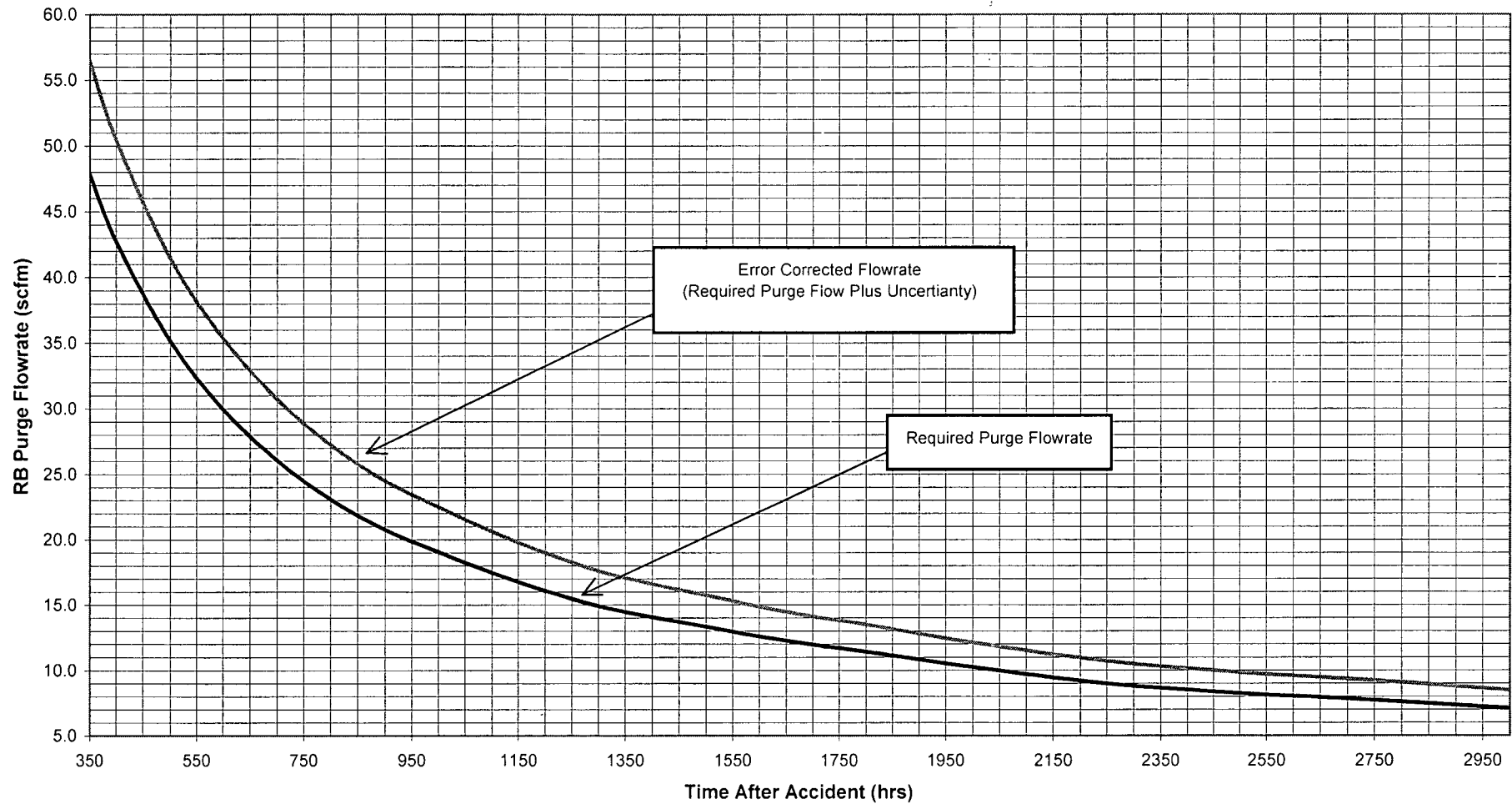
ACCESS ROUTES



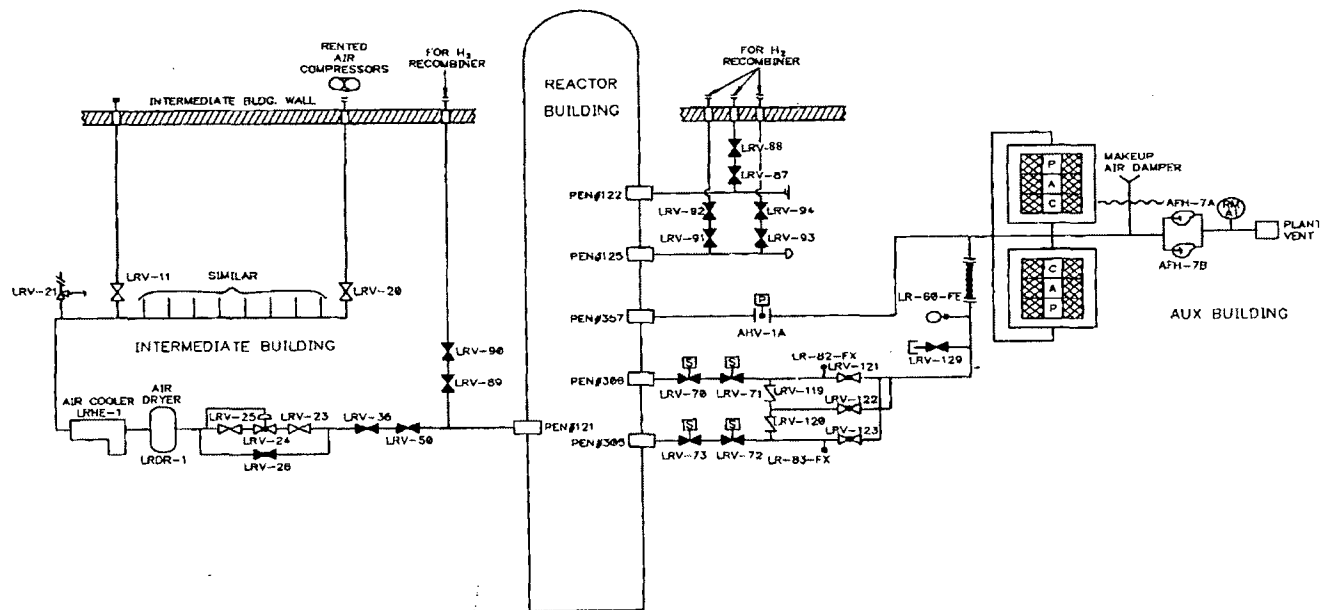
ACCESS ROUTES



CONTINUOUS PURGE FLOW RATES AFTER A LOCA



HYDROGEN PURGE SYSTEM FLOW DIAGRAM



SUMMARY OF CHANGES
PRR # 321652

- NOTES:** 1. Writers and Reviewers: Ensure that any changes to this procedure that affect information contained in Emergency Response Facility posters, enclosures, briefing cards, guidelines etc. are made to those items as well.
2. Writers and Reviewers: Changes to certain parts of this procedure may impact other Emergency Preparedness Implementing Procedures. Ensure appropriate PRRs are initiated as needed.

| SECTION | CHANGE |
|--------------------|---|
| Throughout | Reformatting IAW PRO-NGGC-0201 |
| 1.0.2 | New step stating "this procedure is an emergency plan implementing" procedure. Any revisions to this procedure must be carefully considered for emergency plan impact." (PRR 321652) |
| 2.2 | Added new implementing references section |
| 3.0 | Changed the definition for offshore wind direction to 11.0 to 124.0 degrees. Wind directions from 11 to 146 degrees will transport a release to areas mostly over water. The most significant exception is that about a mile of Hwy 40 in Levy County is west of this line. The range was changed to wind from 11 to 124 degrees to compensate for this area. That would translate to wind from the NNE to ESE sectors. |
| 6.0 | Added a new L&P to caution about hydrogen explosions. Reference the Sutton Hydrogen Event PRR 455377 and NCR 454393. |
| 7.0.1 | Added special tools and equipment |
| 9.0.2 | Added title of EM-104 "Operation of the Operation Support Center" |
| Enclosure 2 | Changed title of enclosure from "Initial Preparation for Purging" to "Preparation for RB Hydrogen Purge" |
| Enclosure 7 | Page numbers were incorrect and fixed during reformatting. (PRR 471789) |
| Summary of Changes | Added two notes before Summary of Changes table (PRR 411912) |

#1242



C
Continuous
Use

CRYSTAL RIVER UNIT 3
PLANT OPERATING MANUAL

EMERGENCY PLAN IMPLEMENTING PROCEDURE

EM-225B

POST-ACCIDENT BORON CONCENTRATION MANAGEMENT

REVISION 12

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1.0 PURPOSE

1. The purpose of this procedure is to provide methodology for determining when post LOCA boron precipitation mitigation is required.
2. This procedure is an emergency plan implementing procedure. Any revisions to this procedure must be carefully considered for emergency plan impact.

2.0 REFERENCES

2.1 Developmental References

1. FPC Calculation M97-0120 - Sump Suction Valve Open Area
2. FPC Calculation M97-0122 - DH Dropline Backflow for Boron Dilution
3. FPC Calculation M97-0097 - Auxiliary Pressurizer Spray Flow Rate
4. FTI Letter IRS-97-4045 dated 10/10/97 Subject: Required APS Flow
5. FTI Letter IRS-97-4220 dated 10/29/97 Subject: DH Drop Line Backflow RELAP Sensitivity Evaluation
6. NOE 97-1628, Instrument Uncertainty Analysis for Boronometer (CA-56-CI)
7. NOE 97-2696, Engineering Evaluation: Incore Temperature Uncertainty
8. FPC Calculation M97-0138, "Temperature/Time Response for the Auxiliary Spray Line During Boron Precipitation Mitigation"
9. FPC Calculation M97-0139, "Temperature/Time Response for the DH Dropline with Gravity Flow Initiated for Born Precipitation"
10. FPC Calculation M97-0098, Boron Dilution by Hot-Leg Injection
11. FPC Calculation M97-0119, Post-LOCA Boron Concentration Management
12. FPC Calculation S96-0134, Fluid Velocity Analysis for RB Sump Screens
13. FPC Calculation M97-0146, Post-LOCA Boron Concentration Management for CR-3
14. FPC Calculation M04-0016, RB Sump Screen - Downstream Effects Evaluation

2.2 Implementing References

1. EM-225E, Guidelines for Long Term Cooling
2. EOP-14, Emergency Operating Procedure Enclosures

3.0 DEFINITIONS

1. **Auxiliary Pressurizer Spray (APS):** A boron precipitation mitigation method that diverts a portion of LPI flow to the pressurizer spray nozzle. Providing flow to the pressurizer builds a height of water in the core region. When an adequate height of water is developed, reverse flow through the core is initiated. This method is only effective if spray flow exceeds core boil-off and is started early enough to allow a liquid level to be established prior to reaching actual core solubility limits.
2. **Delta Boron:** The difference between Expected RB Sump Concentration and actual measured RB sump boron concentration (boronometer, grab sample) after ECCS suction transfer.
3. **Dump To Sump (DTS):** A boron precipitation mitigation method that aligns the DH drop-line to the RB sump through an idle LPI train. This alignment redirects the ECCS injection being lost through a break in the RCS cold leg through the core region. This redirection occurs because the DH drop-line connects to the hot leg at an elevation lower than the RCS cold leg piping.
4. **Expected RB Sump Concentration (Sump_{EXP}):** A calculated value of RB sump boron concentration assuming even mixing of the RCS, CFTs, and BWST located in the RB sump.

4.0 RESPONSIBILITIES

The TSC Accident Assessment Team is responsible for monitoring plant conditions and determining when boron precipitation mitigation is required.

5.0 PREREQUISITES

None

6.0 PRECAUTIONS, LIMITATIONS, AND NOTES

1. APS is the preferred method of boron precipitation mitigation, and should be used if acceptable plant conditions exist. This preference is due to the significant adverse impact on ECCS performance if DTS is improperly implemented, and the need to stop a train of ECCS to perform the DTS alignment.
2. If required for A Train APS effectiveness DHV-5 may be closed provided HPI has been established.
3. Grab samples should be taken from the recirculating fluid to assure correct boronometer performance, if dose limitations allow.
4. Sump sampling should continue to be used after initiation of an active method to assure the boron concentration control mechanism is working effectively.
5. The following must be used for Tincore measurements:
 - "Tincore Average Temp" on SPDS alpha page with input from at least (2) incore thermocouples.
 - The average of at least 2 incore thermocouples displayed on Chessell Recorder (If all inputs are operable the average point may be used).
6. The "Delta Boron Limit" as shown on Attachment 5, Core Boron Control Limit, includes a 25% factor of safety, and shall be used when the core has been in a saturated condition for greater than five (5) hours.
7. Boron precipitation cannot occur if adequate SCM exists.
8. Even if not warranted based on boron concentration indications, the boron precipitation mitigation method may be required to mitigate the consequence of chemical in-vessel effects.
9. Stopping an RB Spray Pump could cause RB pressure to increase.

7.0 SPECIAL TOOLS AND EQUIPMENT

None

8.0 ACCEPTANCE CRITERIA

None

9.0 INSTRUCTIONS

9.1 Contingency Actions for Establishing Auxiliary Pressurizer Spray

1. IF auxiliary pressurizer spray will be used and ES MCC 3AB can **NOT** be energized, **THEN** COORDINATE performance of Attachment 7, Contingency Actions for Establishing Auxiliary Pressurizer Spray, in this procedure N/A ☐ ☐

9.2 Boron Precipitation Mitigation Determination

1. IF adequate SCM exists, **THEN** EXIT this procedure..... N/A ☐ ☐
2. **WHEN** ECCS suction transfer has been completed, **THEN** CALCULATE Expected RB Sump Concentration (Sump_{EXP}) using Attachment 1, Calculation of Expected RB Sump Concentration in this procedure ☐
3. REQUEST the OSC Chemistry Coordinator to have RB sump boron concentration determined on a 2 hour interval ☐
4. IF at any time RB sump sample results are received, **THEN** CALCULATE Delta Boron (Sump_{EXP} - Measured Sump Boron Concentration)..... N/A ☐ ☐
5. IF the RB sump can be sampled, **THEN** CONCURRENTLY PERFORM Attachment 2, Mitigation Matrix with RB Sump Sampling of this procedure..... N/A ☐ ☐
6. IF RB sump **CANNOT** be sampled, **THEN** CONCURRENTLY PERFORM Attachment 3, Mitigation Matrix without RB Sump Sampling of this procedure..... N/A ☐ ☐
7. **WHEN** any one of the following condition exists, **THEN** IMPLEMENT Boron Precipitation per Section 9.3 and 9.4:
- 48 hours has elapsed since the time of the event ☐
OR
 - Boron precipitation mitigation strategy is required as determined per Attachment 2, Mitigation Matrix with RB Sump Sampling ☐
OR
 - Boron precipitation mitigation strategy is required as determined per Attachment 3, Mitigation Matrix without RB Sump Sampling ☐

9.3 Boron Precipitation Mitigation Prerequisites

1. IF LPI crosstie is in progress, **THEN PRIOR TO** directing performance of EOP-14, Enclosure 20, Boron Precipitation Control, ESTABLISH HPI piggyback using EM-225E, Guidelines for Long Term Cooling..... N/A ☐ ☐
2. IF an HPI pump will be started using EOP-14, Enclosure 20, Boron Precipitation Control, **THEN ENSURE** HPI flow is controlled within the limits of EM-225E, Guidelines for Long Term Cooling..... N/A ☐ ☐

9.4 Boron Precipitation Mitigation Initiation

1. IF APS will be directed, **THEN CONSIDER** the following regarding use and effectiveness: N/A ☐ ☐
 - APS should cause Delta Boron to decrease in ≤ 12 hours after initiation ☐
 - Indications of APS flow:
 - MONITOR APS line thermocouple indicated on AH-1003-TIR (DH-61-TE) for early indications of flow. The APS line thermocouple should be \approx DHHE outlet temperature in ≤ 1 minute ☐
 - Continued RB sump sampling, in the longer term, will provide positive verification of successful mitigation..... ☐
2. IF DTS will be directed, **THEN CONSIDER** the following regarding use and effectiveness: N/A ☐ ☐
 - DTS should cause Delta Boron to decrease in ≤ 10 hours after initiation ☐
 - Indications of DH drop-line flow:
 - MONITOR DH drop-line thermocouple indicated on AH-1003-TIR (DH-60-TE) for early indications drop-line flow ☐
 - Continued RB sump sampling, in the longer term, will provide positive verification of successful mitigation..... ☐
 - Adequate flow in the drop line can be inferred if any of the following exist:
 - IF the difference between initial Tincore and average RB temperature is $< 40^{\circ}\text{F}$, **THEN** Tincore should be 90% of average RB temperature within 13 minutes..... N/A ☐ ☐
 - IF the difference between initial Tincore and average RB temperature is $> 40^{\circ}\text{F}$, **THEN** Tincore should be 90% of average RB temperature within 26 minutes..... N/A ☐ ☐
3. **WHEN** boron precipitation mitigation is required, **THEN DIRECT** the Control Room to perform the appropriate alignment using EOP-14, Enclosure 20, Boron Precipitation Control ☐

Subsection 9.4, Boron Precipitation Mitigation Initiation (Cont'd)

4. IF all the following exist, THEN DIRECT the Control Room to close DHV-5 N/A ☐ ☐
- APS has been directed as the boron precipitation mitigation method ☐
 - A Train LPI is providing APS flow ☐
 - APS was aligned using EOP-14, Enclosure 20, Boron Precipitation Control ☐
 - Tincore plots on Attachment 4, APS Effectiveness, indicate DHV-5 must be closed for APS effectiveness ☐

9.5 Follow-Up Actions

1. CONTINUE RB sump monitoring and plotting of Delta Boron..... ☐

10.0 RECORDS

All attachments are quality records.

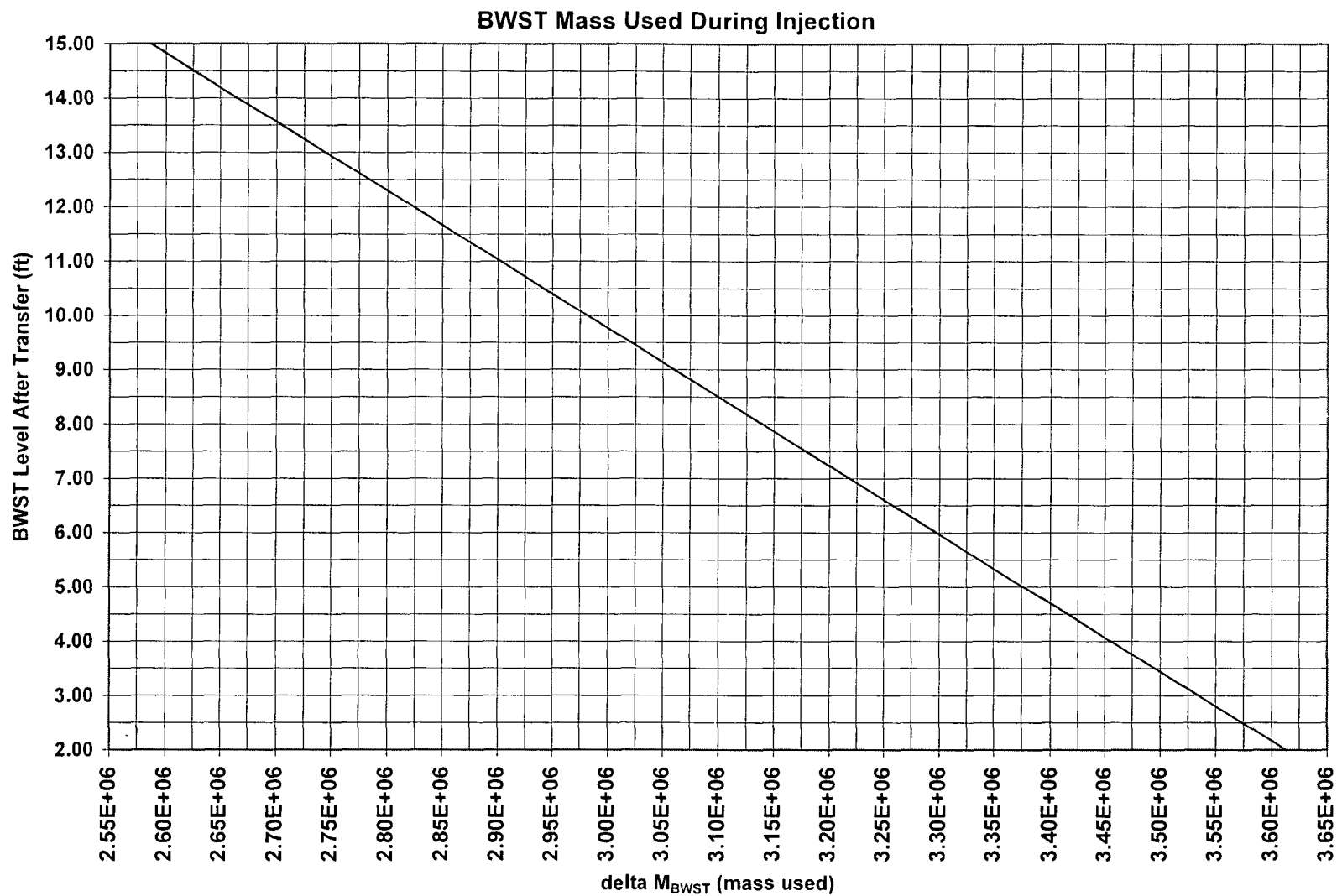
CALCULATION OF EXPECTED RB SUMP CONCENTRATION

- OBTAIN the following data:
 - Pre-LOCA BWST Boron Concentration (C_{BWST})..... ppmb
 - Pre-LOCA RCS Boron Concentration (C_{RCS})..... ppmb
- DETERMINE ΔM_{BWST} using Page 2 of this Attachment.....
- CALCULATE Expected RB Sump Concentration ($Sump_{EXP}$):

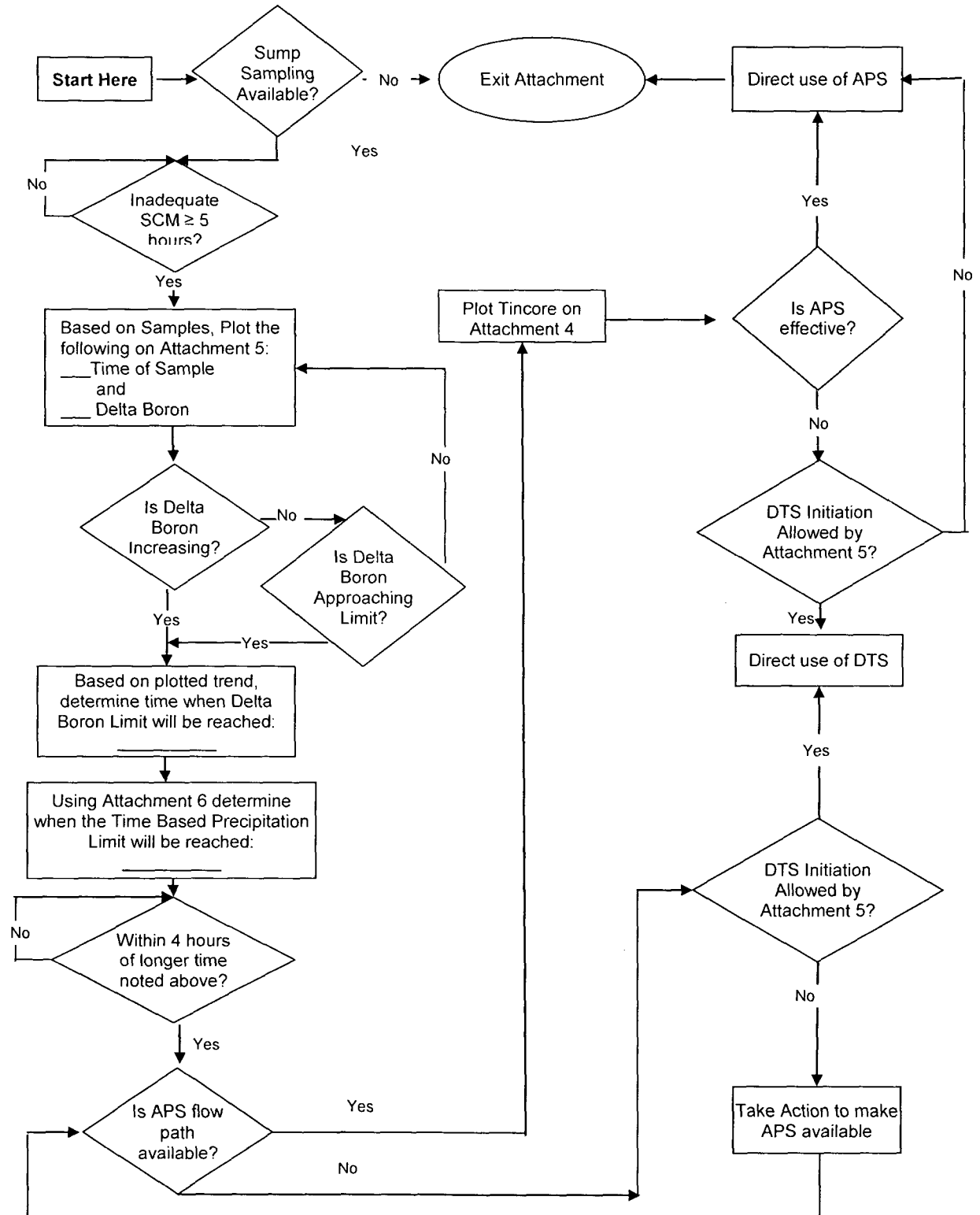
$$Sump_{EXP} = \frac{(\Delta M_{BWST} * C_{BWST}) + (M_{CFTS} * C_{CFTS}) + (M_{RCS} * C_{RCS})}{\Delta M_{BWST} + M_{CFTS} + M_{RCS}}$$

$$= \frac{(\quad) + (4.7 E^8) + (5.1 E^5 * \quad)}{(\quad) + (1.3 E^5) + (5.1 E^5)}$$

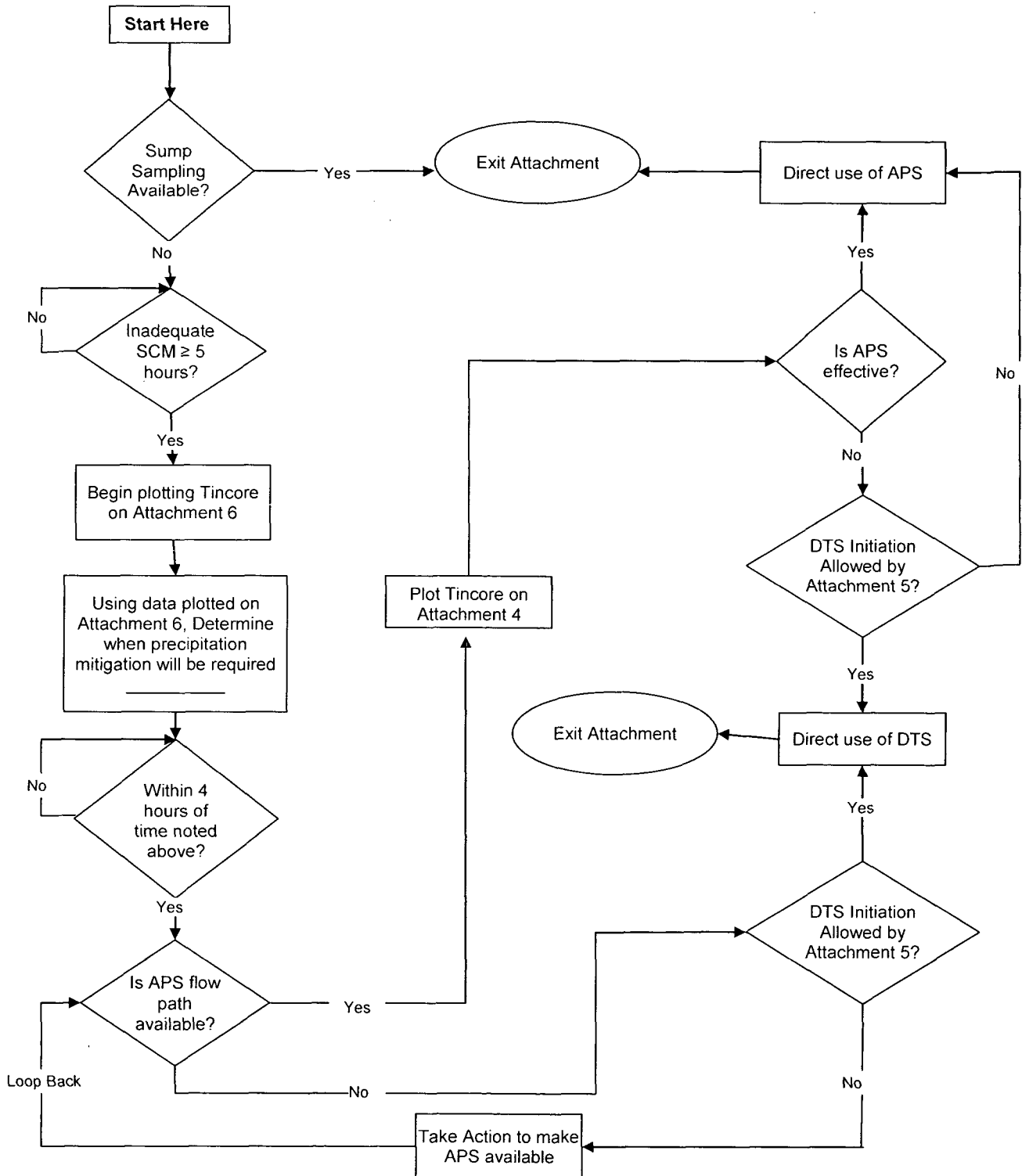
CALCULATION OF EXPECTED RB SUMP CONCENTRATION (CONT'D)



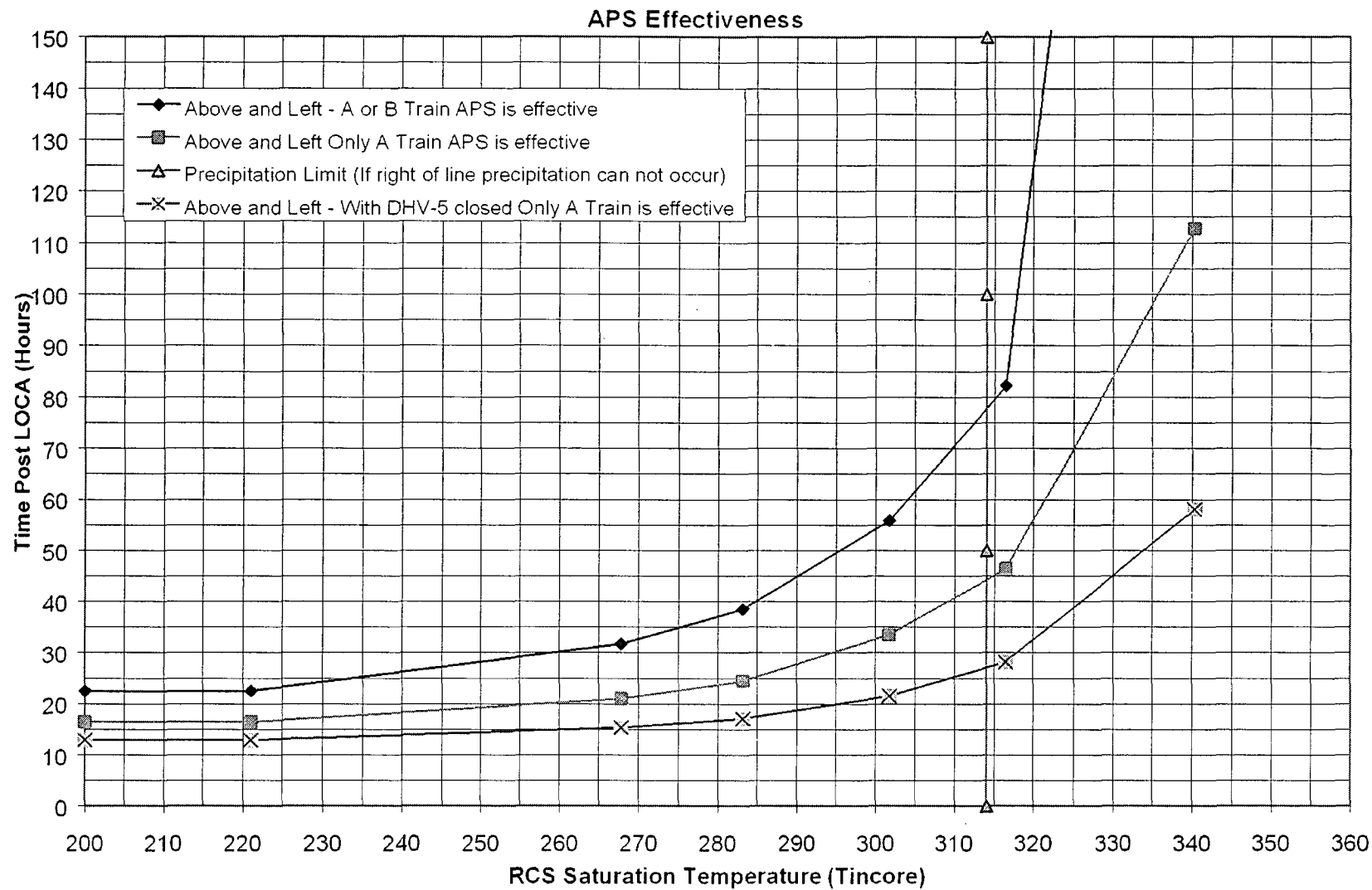
MITIGATION MATRIX WITH RB SUMP SAMPLING



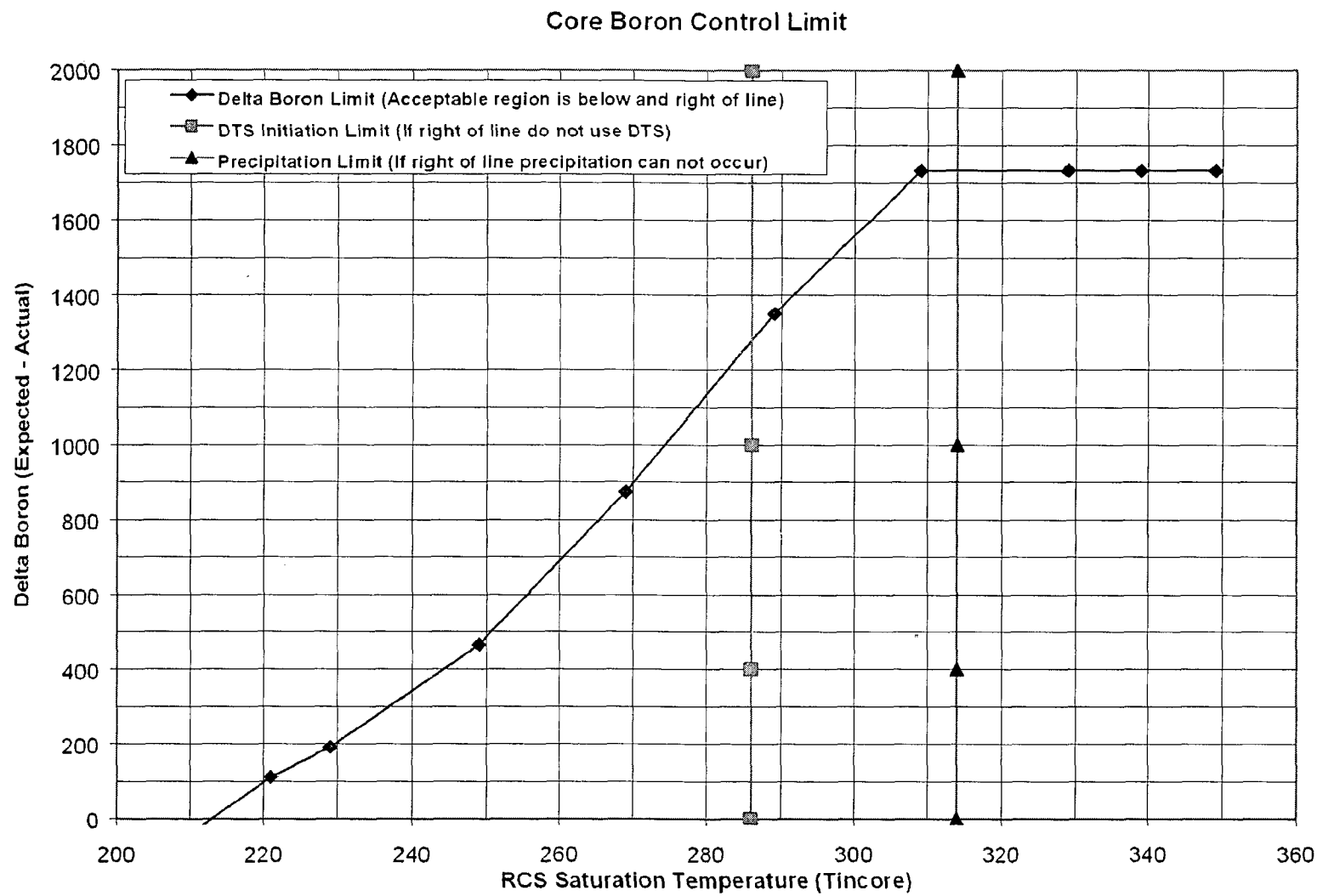
MITIGATION MATRIX WITHOUT RB SUMP SAMPLING



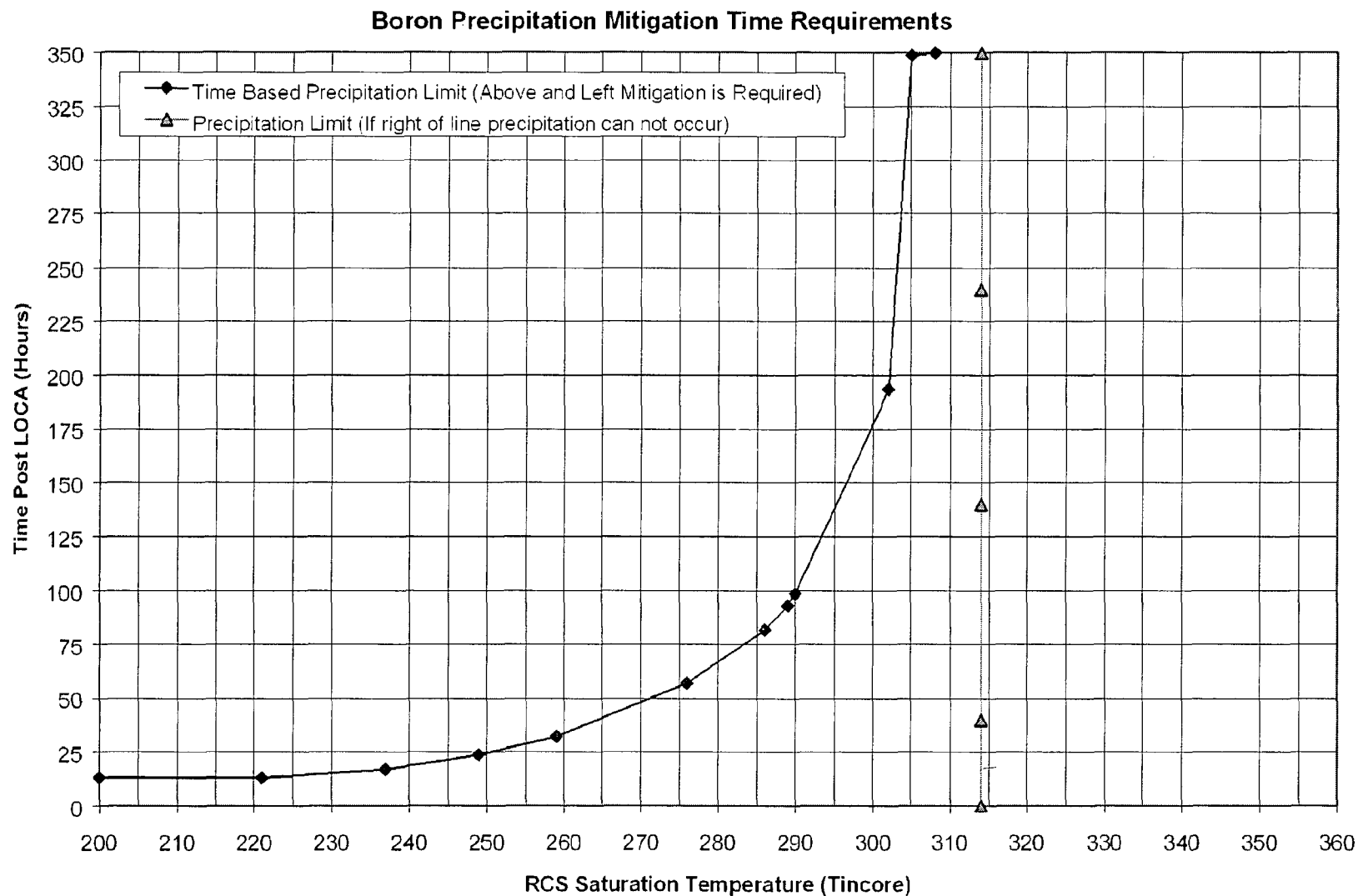
APS EFFECTIVENESS



CORE BORON CONTROL LIMIT



BORON PRECIPITATION MITIGATION TIME REQUIREMENTS



CONTINGENCY ACTIONS FOR ESTABLISHING AUXILIARY PRESSURIZER SPRAY**1.0 PURPOSE**

1. The purpose of this attachment is to manually initiate APS. The instructions provide a method for manually opening DHV-91 and establishing temporary power for RCV-53 in the event of a power failure to ES MCC 3AB. The re-powering instructions are set up in two sections, dependent upon the condition and failure mode of ES MCC 3AB. The condition of ES MCC 3AB and the associated area dose rates must be considered before performing these instructions.
2. **Section "A":** Instructions provide temporary power to ES MCC 3AB-5B in the event of loss of power to ES MCC 3AB, however the control circuitry and indication for RCV-53 will still be utilized at ES MCC 3AB-5B.
3. **Section "B":** Instructions provide temporary power and control circuitry for RCV-53, utilizing ES MCC 3B1-8C (Ref. dwg. 206-056). Local control and indication will be at this MCC. ES MCC 3AB is assumed to be inoperable, and no longer intact.

2.0 REFERENCES**2.1 Implementing References**

1. MP-405A, Handling, Pulling and Terminations for Safety and Non Safety Related Cables.

2.2 Developmental References

1. Print EC-206-058, One Line - Motor Control Center ES-3AB- AUX. BLDG.- 119'0'
2. Print EC-206-056, One Line - Motor Control Center ES-3B1- AUX. BLDG.-119'0'
3. Print B-208-047 RC-16 Elementary Diagram, RCV-53
4. Print B-208-082 RS-10 Elementary Diagram, Remote Shutdown Panel RCV-53
5. Print 209-047 RC-04 Interconnection Diagram, RCV-53
6. Print 209-101 Sh. 28 Interconnection Diagram, Penetration 308
7. Vendor Drawing Y-90543 Sh. 3, ES MCC 3B1-8C fuses

CONTINGENCY ACTIONS FOR ESTABLISHING AUXILIARY PRESSURIZER SPRAY**3.0 PERSONNEL INDOCTRINATION****3.1 Material Parts List**

1. Materials for this procedure are located in EOB-13, located at 145' Aux Bldg. near the RB purge exhaust valve room.

3.2 Limits And Precautions

1. The panel must be de-energized and checked to ensure the absence of any 480 VAC voltage prior to performing work in the panel. Consideration should be given for processing an equipment clearance based on the dose rates and time allowed for this activity.
2. Cables should exit the panel via the bottom.
3. This activity must be fully reviewed with the Radiological Assessment Team in the TSC to determine the best route to take in performing this activity. If dose rates are prohibitive in the areas required by this activity, then this activity should not be performed and other measures should be evaluated by the Accident Assessment Team.

3.3 Prerequisites

1. Personnel assigned shall be knowledgeable, experienced, and qualified to perform the specified tasks as determined by the appropriate supervisor or Maintenance representative in the TSC/OSC..... ☐
2. Tools and equipment required for this task are pre-staged in the tool box (EOB-13) located at 145' Aux Bldg. near the RB purge exhaust valve room. All cables are pre-lugged and marked for proper installation. Electrical gloves, meter, and safety clothing are obtained from the Electric shop prior to entrance into the Aux Bldg ☐
3. To remove equipment to be worked from service, evaluate the need to obtain an equipment clearance. Due to the plant conditions, which could be present when performing this activity, tags may not be necessary. COORDINATE this activity through the TSC ☐
4. The person in charge of this activity must ensure the following:
 - Work Group has reviewed and understands previous sections of this attachment..... ☐
 - Initial conditions have been met ☐
 - Safety briefing has been conducted ☐
 - Emergency Coordinator has been notified ☐

Completed by: _____ Date: _____

CONTINGENCY ACTIONS FOR ESTABLISHING AUXILIARY PRESSURIZER SPRAY**3.4 Responsibilities**

1. The TSC Emergency Repair Team is responsible for ensuring qualified individuals are assigned to perform the temporary power configurations and that proper work practices and boundaries are considered during this evolution, including the use of Concurrent Verification.

4.0 INSTRUCTIONS**4.1 Verify DHV-91 is open:**

1. IF DHV-91 cannot be opened from the Main Control Room, **THEN** ESTABLISH a Re-entry Team to manually open DHV-91 "DH TO PZR SPRAY ISO" 119 ft AB penetration area..... N/A ☐ ☐

4.2 Section "A":

- NOTES:**
1. This section of instructions provide temporary power to ES MCC 3AB-5B in the event of loss of power to ES MCC 3AB. However, the control circuitry and indication for RCV-53 will still be utilized at ES MCC 3AB-5B ☐
 2. These instructions anticipate that ES MCC 3AB is still intact and the normal breaker cubicle for RCV-53 can be used ☐

1. IF required, **THEN** OBTAIN proper clearances from Operations to work in ES MCC 3B1-8C and ES MCC 3AB-5B..... N/A ☐ ☐
2. OBTAIN approximately 100 ft. of 1-3/C-10 cable. This cable is tagged as "power" and is located in the "Section A" materials bag, in EOB-13 located on 145' Aux Bldg. near the RB purge exhaust valve room ☐
3. ROUTE the "power" cable (1-3/C-10) from ES MCC 3B1-8C to ES MCC 3AB-5B ☐
4. ENSURE the breaker at 480V ES MCC 3AB-5B is open ☐

CONCURRENT VERIFICATION POINT

5. DETERMINE the three conductors on the line side of the breaker in ES MCC 3AB-5B **AND** TAPE the bare ends of the conductors **AND** SECURE /
Initial / CV
6. REMOVE the bottom plate of ES MCC 3AB below breaker 5C, **AND** OPEN the door to breaker 5C to allow the cable to be routed through the bottom of the motor control center ☐

CONTINGENCY ACTIONS FOR ESTABLISHING AUXILIARY PRESSURIZER SPRAY**CONCURRENT VERIFICATION POINT**

7. TERMINATE one end of the "power" cable (1-3/C-10) to the line side of breaker located in ES MCC 3AB-5B as follows: L1, L2, L3, left to right respectively /
Initial / CV
8. ENSURE the breaker located in ES MCC 3B1-8C is open ☐

CONCURRENT VERIFICATION POINT

9. DETERMINATE the three conductors on the load side of the breaker in ES MCC 3B1-8C **AND** TAPE the bare ends of the conductors **AND** SECURE /
Initial / CV
10. REMOVE the bottom plate of ES MCC 3B1 below breaker 8D, **AND** OPEN the door to breaker 8D to allow the cable to be routed through the bottom of the motor control center ☐

CONCURRENT VERIFICATION POINT

11. TERMINATE the other end of the "power" cable (1-3/C-10) to the load side of the breaker in ES MCC 3B1-8C as follows: L1, L2, L3, left to right respectively /
Initial / CV
12. IF dose rates allow, **THEN** ensure cable is protected where personnel or equipment may need to cross over N/A ☐ ☐
13. INSPECT "power" cable installation **AND** ENSURE ready for energizing ☐
14. OBTAIN permission from Operations to energize the temporary power installation ☐
15. CLOSE the breaker located in ES MCC 3B1-8C ☐
16. VERIFY voltage at the load side of breaker in ES MCC 3B1-8C ☐
17. CLOSE the breaker located in ES MCC 3AB-5B ☐
18. VERIFY voltage at the load side of breaker in ES MCC 3AB-5B ☐
19. NOTIFY the supervisor in charge of this activity that temporary power installation for RCV-53 is ready to test ☐
20. TEST temporary power installation for RCV-53 as described in Section 9.4 ☐

CONTINGENCY ACTIONS FOR ESTABLISHING AUXILIARY PRESSURIZER SPRAY**4.3 Section "B":**

- NOTES:**
1. This section of instructions provide temporary power and control circuitry for RCV-53, utilizing ES MCC 3B1-8C (Ref. dwg. 206-056). Local control and indication will be at ES MCC 3B1-8C..... ☐
 2. The normal feed for RCV-53, ES MCC 3AB-5B is assumed to be inoperable, and no longer intact. Remote Shutdown and Control Room indication and control will be removed as a result of this activity..... ☐

1. COORDINATE with Operations **AND** OBTAIN clearances as required for ES MCC 3B1-8C and ES MCC 3AB-5B (Ref. dwg. 206-056)..... ☐

CONCURRENT VERIFICATION POINT

2. LOCATE cable RCC281 as indicated on ref. dwg. 209-101 sheet 28, at penetration 308, located outside the RB, in SE quadrant under RB purge exhaust valves **AND** CUT cable RCC281 to allow for butt splicing temporary power to the power cables outside the cable tray..... /

Initial / CV

CONCURRENT VERIFICATION POINT

3. DETERMINATE the following conductors (Ref. drawing 209-047 RC-04) at Term Box RC 11, located on the east wall opposite penetration 308:

| Circuit | Wire Mark / Color | Term | Performed | Concurrent Verification |
|---------|-------------------|---------|-----------|-------------------------|
| RCC283 | 1/1 | TB-A-1 | | |
| | 11/4 | TB-A-5 | | |
| | 12/2 | TB-A-6 | | |
| | 13/3 | TB-A-7 | | |
| | 14/7 | TB-A-8 | | |
| | 15/9 | TB-A-9 | | |
| | 21/5 | TB-A-13 | | |
| | 33/6 | TB-A-14 | | |
| RCC284 | 32/8 | TB-A-16 | | |
| | 17/4 | TB-A-10 | | |
| | 18/3 | TB-A-11 | | |
| | 19/7 | TB-A-12 | | |
| RCC312 | 34/1 | TB-A-15 | | |
| | 1/1 | TB-A-1 | | |
| | 5/5 | TB-A-3 | | |
| | 9/3 | TB-A-4 | | |
| | 12/2 | TB-A-6 | | |
| | 21/4 | TB-A-13 | | |

CONTINGENCY ACTIONS FOR ESTABLISHING AUXILIARY PRESSURIZER SPRAY

4. OBTAIN materials located in the "Section B" materials bag, in EOB-13, located on the 145' Aux Bldg. near the RB purge exhaust valve room..... ☐
5. ROUTE the "control" cable (1-9/C -14) from Term Box RC 11 and the "power" cable (1-3/C-10) from penetration 308 to ES MCC 3B1..... ☐
6. IF time allows, THEN ENSURE the cable on the 119' elevation near ES MCC 3B1 is not a tripping hazard. TIE wrap cables as necessary to secure N/A ☐ ☐

NOTE: Butt splices are to be made outside the cable tray ☐

CONCURRENT VERIFICATION POINT

7. SPLICE the "power" cable (1-3/C-10) to cable RCC281 from penetration 308 /
Initial / CV

CONCURRENT VERIFICATION POINT

8. TERMINATE the "control" cable (1-9/C-14) (Ref. dwg. 209-047 RC-04) at Term Box RC 11 as follows:

| Wire Color / Mark | Term | Performed | Concurrent Verification |
|-------------------|--------|-----------|-------------------------|
| 1/1 | TB-A-1 | | |
| 2/5 | TB-A-3 | | |
| 3/9 | TB-A-4 | | |
| 4/11 | TB-A-5 | | |
| 5/13 | TB-A-7 | | |
| 6/14 | TB-A-8 | | |

CONCURRENT VERIFICATION POINT

9. TERMINATE the #14 AWG Jumper (Ref. dwg. 209-047 RC-04) at Term Box RC 11 as follows:

| From | To | Performed | Concurrent Verification |
|---------|--------|-----------|-------------------------|
| TB-A-14 | TB-A-1 | | |

10. ENSURE the breaker located in ES MCC 3B1-8C is open ☐
11. REMOVE the bottom plate of ES MCC 3B1 below breaker 8D, AND OPEN the door to breaker 8D to allow the cable to be routed through the bottom of the motor control center ☐

CONTINGENCY ACTIONS FOR ESTABLISHING AUXILIARY PRESSURIZER SPRAY **CONCURRENT VERIFICATION POINT**

12. TERMINATE "control" cable (1-9/C-14) at ES MCC 3B1-8C as follows:

| Wire Color / Mark | Termination | Performed | Concurrent Verification |
|-------------------|-------------|-----------|-------------------------|
| 1/1 | 8C-1 | | |
| 2/5 | 8C-2 | | |
| 3/9 | 8C-5 | | |
| 4/11 | 8C-8 | | |
| 5/12 | 8C-9 | | |
| 6/14 | 8C-10 | | |

CONCURRENT VERIFICATION POINT

13. TERMINATE "power" cable (1-3/C-10) at ES MCC 3B1-8C as follows:

| Wire Color / Mark | Termination | Performed | Concurrent Verification |
|-------------------|-------------|-----------|-------------------------|
| 1/L1 | 8C-T1 | | |
| 1/L2 | 8C-T2 | | |
| 1/L3 | 8C-T3 | | |

14. OBTAIN permission from Operations to energize the temporary power installation ☐
15. CLOSE the breaker located in ES MCC 3B1-8C..... ☐
16. VERIFY voltage at the load side of breaker in ES MCC 3B1-8C..... ☐
17. NOTIFY the supervisor in charge of this activity that temporary power installation for RCV-53 is ready to test ☐
18. TEST the temporary power installation for RCV-53 per Section 9.4 ☐

CONTINGENCY ACTIONS FOR ESTABLISHING AUXILIARY PRESSURIZER SPRAY

4.4 Steps for Checking Proper Motor Rotation for RCV-53

NOTE: Section 9.3 installation instructions remove Remote Shutdown and Control Room indication and control ☐

CAUTION

If the motor leads are reversed, the open limit switch and/or closed torque switch controls will not automatically stop the valve..... ☐

1. **IF** the **amber** light is lit on ES MCC 3B1-8C cubicle door,
THEN PERFORM the following..... N/A ☐ ☐
 - a. While observing the **red** (open) and **green** (close) indicating lights DEPRESS **AND** HOLD the close push button until an indicating light is lit..... ☐
 - b. **IF** the **green** light is lit, **THEN** the motor rotation is correct..... N/A ☐ ☐
 - c. **IF** the **red** light is lit, **THEN** REVERSE two of the motor leads in the ES MCC 3B1-8C cubicle to correct the rotation..... N/A ☐ ☐
 - d. NOTIFY the supervisor that the system is ready for operation..... ☐

CAUTION

If the motor leads are reversed, the open limit switch and/or closed torque switch controls will not automatically stop the valve..... ☐

2. **IF** the **green** light is lit on ES MCC 3B1-8C cubicle door,
THEN PERFORM the following..... N/A ☐ ☐
 - a. DEPRESS **AND** HOLD the open push button for maximum of three (3) seconds and observe indication lights ☐
 - b. **IF** the **green** light is lit, **THEN** REVERSE two of the motor leads in the ES MCC 3B1-8C cubicle to correct the rotation N/A ☐ ☐
 - c. **IF** the **amber** light is lit, **THEN** the motor rotation is correct..... N/A ☐ ☐
 - d. NOTIFY the supervisor that the temporary power for RCV-53 is ready ☐

CONTINGENCY ACTIONS FOR ESTABLISHING AUXILIARY PRESSURIZER SPRAY

CAUTION

If the motor leads are reversed, the open limit switch and/or closed torque switch controls will not automatically stop the valve..... ☐

3. **IF** the **red** light is lit on ES MCC 3B1-8C cubicle door,
THEN PERFORM the following..... N/A ☐ ☐
 - a. DEPRESS **AND** HOLD the close push button for maximum
of three (3) seconds and observe indication lights ☐
 - b. **IF** the **red** light is lit, **THEN** REVERSE two of the motor leads
in the ES MCC 3B1-8C cubicle to correct the rotation..... N/A ☐ ☐
 - c. **IF** the **amber** light is lit, **THEN** motor rotation is correct..... N/A ☐ ☐
 - d. NOTIFY the supervisor that the temporary power for
RCV-53 is ready ☐

Summary of Changes PRR 321653

- NOTES:** 1. Writers and Reviewers: Ensure that any changes to this procedure that affect information contained in ERF posters, enclosures, briefing cards, guidelines etc. are made to those items as well.
2. Writers and Reviewers: Changes to certain parts of this procedure may impact other EIPs. Ensure appropriate PRRs are initiated as needed.

| SECTION | CHANGE |
|--------------------|---|
| Throughout | reformatting IAW PRO-NGGC-0201 and incorporated editorial. |
| Throughout | Enclosure 1 became Attachment 1 Enclosure 2 became Attachment 2 Enclosure 3 became Attachment 3 Enclosure 4 became Attachment 4 Enclosure 5 became Attachment 5 Enclosure 6 became Attachment 6 Enclosure 7 became Attachment 7 |
| 1.0.2 | Added new purpose step stating "this procedure is an emergency plan implementing procedure. any revision to this procedure must be carefully considered for emergency plan impact." (PRR 321653) |
| 2.2 | Added new implementing reference section |
| 9.1 | Changed the title to "Contingency Actions for Establishing Auxiliary Pressurizer Spray" |
| 9.1.1 | Changed beginning of step from ____ to "IF auxiliary pressurizer spray will be used and" |
| Summary of Changes | Added two new notes before Summary of Changes Table (PRR 411913) |

#1242



I
Information
Use

CRYSTAL RIVER UNIT 3
PLANT OPERATING MANUAL

EM-225C

**POST ACCIDENT MONITORING OF
REACTOR BUILDING TEMPERATURE**

REVISION 6

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1.0 PURPOSE

1. The purpose of this procedure is to provide guidance to the TSC Accident Assessment Team to monitor and take action to ensure Reactor Building (RB) temperatures remain below the qualified threshold limits for environmentally qualified components. If temperatures approach a predetermined limit, then actions will be taken to reduce RB temperatures to acceptable values.
2. This procedure is an emergency plan implementing procedure. Any revisions to this procedure must be carefully considered for emergency plan impact.

2.0 REFERENCES

2.1 Developmental References

1. ITS 3.6.5 Containment Air Temperature
2. Environmental Qualification Plant Profile Document
3. IOC NOE 97-2534, Assessment to support EM-225C for SBLOCA EQ Concerns, dated 12/4/97
4. Calculation M-97-0072, CR-3 Containment Analysis for SBLOCA, Rev. 2
5. PC 97-7607
6. IOC NSM 98-0592, Close out of the DR/JCO related to PC 97-7607 - RB EQ Temperatures from a SBLOCA event, dated 4/2/98
7. Calculation M-97-0132, CR3 Containment Analysis, Rev. 7
8. PC 00-0830, Enclosure 1 curve in EM-225C appears to be incorrect, dated 3/16/00
9. Calculation M-90-0021, Building Spray and Decay Heat NPSH, Rev. 12
10. Calculation E01-0001, Determination of Post Accident Operating Times for EQ Components Subjected To SBLOCA Conditions, Rev. 1, Historical

3.0 DEFINITIONS

None

4.0 RESPONSIBILITIES

The TSC Accident Assessment Team is responsible for monitoring RB temperatures post accident, and to provide recommendations to the Emergency Coordinator to initiate building spray if temperatures reach the limits established in this procedure.

5.0 PREREQUISITES

None

6.0 PRECAUTIONS LIMITATIONS AND NOTES

1. Large break LOCAs and larger small break LOCAs will result in RB Pressures that actuate building spray automatically. Actions to manually start building spray to reduce RB temperatures will not be required in these situations.
2. Prior to starting any ES powered component, adequate load margin must be available if the ES 4160 volt busses are energized from the emergency diesel generators.
3. Prior to starting a building spray pump, building spray flow control valves must be set for 1200 gpm if ECCS suction has been transferred to the RB Sump.
4. If a SGTR is in progress then ensure adequate RB sump level is available prior to transferring or starting a BS pump from the RB Sump. With a SGTR, sufficient RB sump level might not be available due to loss from the SGTR. Reference calculation M-90-0021 for BSP NPSH requirements.

7.0 SPECIAL TOOLS AND EQUIPMENT

None

8.0 ACCEPTANCE CRITERIA

None

9.0 INSTRUCTIONS

1. If at least one building spray pump is running, then exit this procedure. No further action is required.
2. If an RCS leak is occurring in the reactor building, then begin plotting average RB temperature on Enclosure 1, Limiting RB Temperature for at least 1 hour intervals in the beginning of the event. The plotting interval can be changed based on plant conditions.
3. RB Temperature is the average of the following four temperature elements:

| TEMPERATURE ELEMENT | CONTROL ROOM RECORDER | RECALL POINT | COMPUTER POINT | RB ELEV. |
|---------------------|-----------------------|--------------|----------------|----------|
| AH-536-TE | AH-1003-TIR | RECL-77 | S358 | 102 |
| AH-537-TE | ↓ | RECL-78 | S359 | 125 |
| AH-538-TE | | RECL-80 | S382 | 180 |
| AH-539-TE | | RECL-81 | S383 | 235 |
| AVERAGE | | | S837 | |

4. If average RB Temperature is in the "Acceptable" Region of Enclosure 1, Limiting RB Temperature, and decreasing, then exit this procedure.
5. If at any time average RB temperature reaches "Action Required boundary" region of Enclosure 1, Limiting RB Temperature, then obtain Emergency Coordinator concurrence to start at least one building spray pump.
6. If a building spray pump is required and EC concurrence has been obtained, then perform the following:
 - a. Ensure load is available on the ES diesel generators per EOP-13, Rule 5.
 - b. Ensure Building Spray flow controls are set at 1500 GPM and "Remote" if pumps are aligned to BWST, or 1200 GPM and "LOCAL" if aligned to the RB Sump.
 - c. Notify the control room to start one building spray pump.
7. Continue to monitor RB Temperature.
8. If RB Temperature does not lower to the acceptable region of Enclosure 1, Limiting RB Temperature, then notify control room to start a second building spray pump if available.

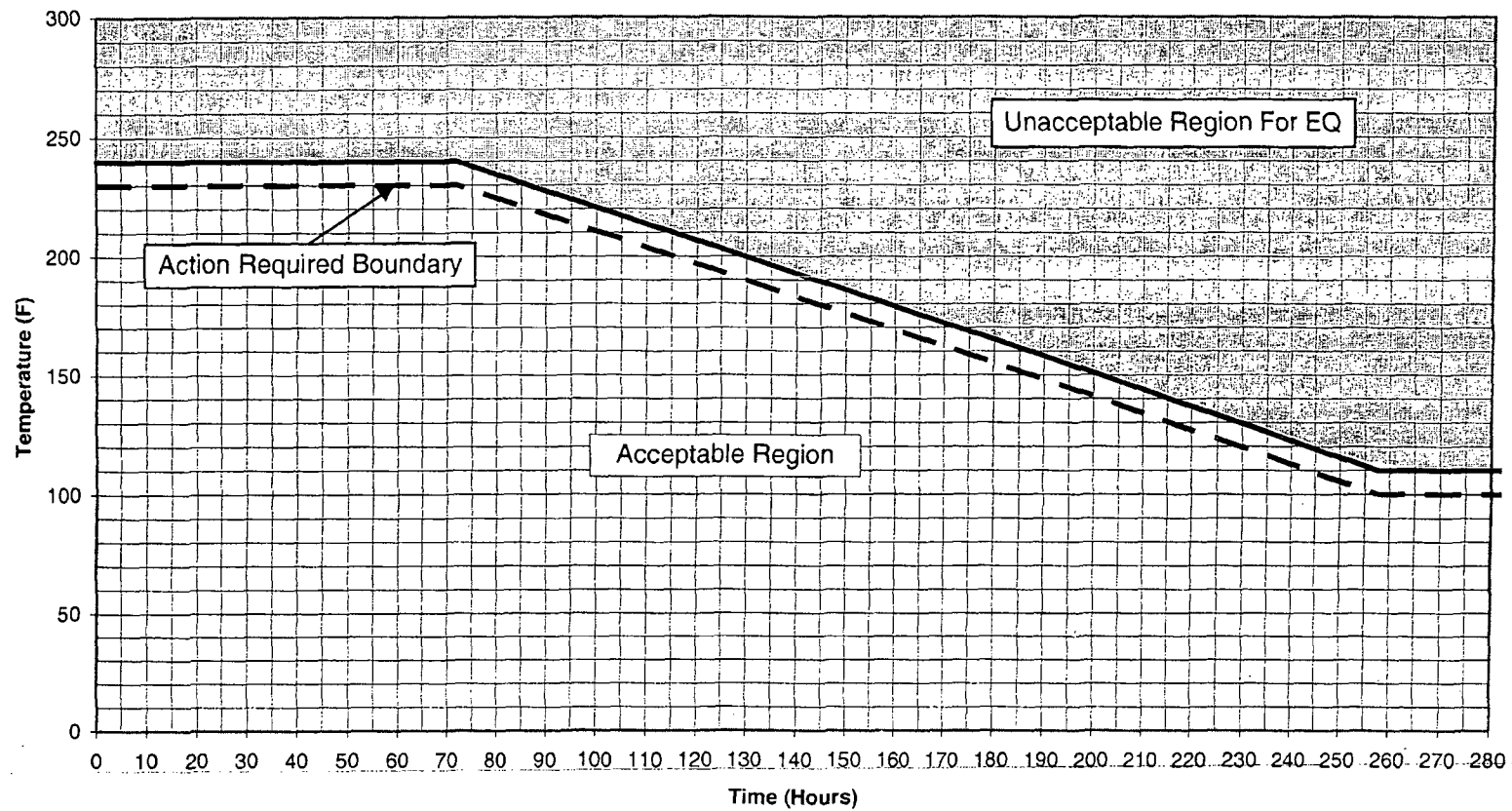
NOTE: If building spray pumps are running, Emergency Operating Procedures provide guidance to secure them. If building spray pumps are secured, begin additional monitoring of RB Temperatures until a continuing decreasing trend is achieved.

9. When building spray pumps are running, then exit this procedure.

10.0 RECORDS

No records generated by this procedure.

LIMITING RB TEMPERATURE



Summary of Changes
PRR 233084

- NOTES:** 1. Writers and Reviewers: Ensure that any changes to this procedure that affect information contained in ERF posters, enclosures, briefing cards, guidelines etc. are made to those items as well.
2. Writers and Reviewers: Changes to certain parts of this procedure may impact other EIPs. Ensure appropriate PRRs are initiated as needed.

| SECTION | CHANGE |
|--------------------|--|
| Throughout | reformatting IAW PRO-NGGC-0201 |
| 1.0.2 | New purpose step stating "this procedure is an emergency plan implementing procedure. any revisions to this procedure must be carefully considered for emergency plan impact." (PRR321654) |
| 2.1.2 | Changed from Environmental and Seismic Qualification Program Manual to Environmental Qualification Plant Profile Document (PRR 233084) |
| 2.1.10 | Reference has turned to historical. Put the word historical at the end of the reference. |
| Summary of Changes | Added two new notes in front of summary of changes table (PRR 411914) |

#1242



I
Information
Use

CRYSTAL RIVER UNIT 3
PLANT OPERATING MANUAL

EM-225D

**GUIDANCE FOR OTSG TUBE TO SHELL DELTA T MONITORING AND
CONTROL**

REVISION 5

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1.0. PURPOSE

1. The purpose of this procedure is to provide guidance to the TSC Accident Assessment Team (AAT) to monitor OTSG conditions that may challenge OTSG tube-to-shell delta T limits, and provide recommendations to the Emergency Coordinator and Control Room on methods to prevent delta T limits from being exceeded.
2. These guidelines are applicable when reliable OTSG Tube to Shell delta T instrumentation is unavailable or Tube to Shell delta T cannot be maintained within Limits.
3. This procedure is an emergency plan implementing procedure. Any revisions to this procedure must be carefully considered for emergency plan impact.

2.0 REFERENCES

2.1 Developmental References

1. Framatome Technology Letter INS-97-4651, dated 11/25/97
2. FTI Document No. 51-1224886-02, OTSG Refill Summary Report
3. Calculation M97-0156, CR-3 EOP Natural Circulation Tube Loads (FTI Document No. 51-1266247-00)
4. Emergency Operating Procedures Technical Bases Document, Volume 1
5. Calculation M01-0001, OTSG Tube-to-Shell Temperature Differential during Idle Loop Cooldown

2.2 Implementing References

1. EOP-13, EOP Rules
2. EOP-14, Emergency Operating Procedure Enclosure
3. OP-407R, Operations Involving MWST Processing via Waste Processing Demineralizer System

3.0 DEFINITIONS

1. **Dry OTSG:** Any OTSG with an indicated level of ≤ 12.5 inches as read on the EFIC low range level instruments.
2. **OTSG integrity:** OTSG integrity exists if the secondary side pressure boundary is intact, allowing an OTSG to pressurize when supplied with feedwater.
3. **OTSG Shell Temperature:** The temperature of the bulk of the metal composing the shell of an OTSG. Shell temperature on a dry OTSG will lower over time as heat is lost to the Reactor Building. The shell is estimated to cool at approximately $3^{\circ}\text{F}/\frac{1}{2}$ hour. Enclosure 1, Minimum RCS Temperature Curve provides an estimate of shell temperature versus time.
4. **RCS Tincore:** The temperature indication supplied by the incore thermocouples to SPDS, Tsat monitors and the core exit temperature recorders in the Control Room. Tincore is used to estimate average OTSG tube temperature when at least 1 RCP is running. Tincore can be determined from SPDS, or if SPDS is not available, use average Tincore from the core exit chart recorders on the MCB (RC-171-TR, RC-172-TR).

Section 3.0, DEFINITIONS (Cont'd)

5. **OTSG Tube Temperature:** The temperature associated with the tubes of an OTSG. Tube temperature can be determined using Tincore when at least 1 RCP is running. If no RCPs are running, tube temperature can only be estimated if natural circulation exists in the OTSG. Natural Circulation will only occur if the dry OTSG is being fed. If natural circulation exists, That can be used to approximate tube temperatures.
6. **OTSG Tube to shell delta T:** The difference between OTSG tube temperature and the OTSG shell temperature. If the tubes are hotter than the shell, the tubes are in compression (compressive stress). If the tubes are colder than the shell, the tubes are in tension (tensile stress).

4.0 RESPONSIBILITIES

1. TSC Accident Assessment Team: Responsible for monitoring OTSG conditions that may result in excessive tube to shell delta T, and to recommend actions to the Emergency Coordinator and the Control Room to minimize tube stresses under these conditions.
2. Emergency Coordinator: Responsible for reviewing and approving all recommendations provided by the Accident Assessment Team prior to implementation by the Control Room staff.

5.0 PREREQUISITES

None

6.0 PRECAUTIONS LIMITATIONS AND NOTES

1. Initiating a source of feedwater to an OTSG that does not have integrity must be carefully evaluated and planned to prevent harm to personnel and damage to vital plant equipment.
2. If either ES 4160 volt bus is energized from an emergency diesel generator, then prior to starting any ES powered component ensure adequate load margin is available on the EDG. Refer to EOP-13, Rule 5.
3. Establishing feedwater flow to a faulted OTSG with a feedwater or steam line break in the Reactor Building could dilute sump recirculation fluid if a LOCA was in progress or subsequently occurs.
4. OTSG tube compression limit (tubes hotter than shell) is 60°F.
5. OTSG tube tensile limit (tubes cooler than shell) is 100°F.
6. All actions recommended to the Control Room as a result of this procedure must be pre-approved by the Emergency Coordinator.
7. The operating crew and the TSC staff should monitor for indications of a steam generator tube leak during the RCS cooldown.

7.0 SPECIAL TOOLS AND EQUIPMENT

None

8.0 ACCEPTANCE CRITERIA

None

9.0 INSTRUCTIONS

9.1 General Guidelines

1. Refer to Enclosure 3, Mitigation Strategy Diagram for an overall approach to control OTSG tube to shell delta T.
2. If shell temperatures appear accurate, then monitor shell temperatures using shell thermocouples referenced below. The shell thermocouples may provide useful trend data.

| | | |
|--------|-----------------------|---------------|
| A-OTSG | A-730,731,732,733,734 | Average R-771 |
| B-OTSG | A-735,736,737,738,739 | Average R-772 |

3. If any OTSG shell temperature computer points appear inaccurate then average the remaining accurate computer points for the effective OTSG to determine average temperature.
4. If shell thermocouples are accurate, then cooldown rate should be adjusted as necessary to control tube to shell delta T within above limits (Ref 6.0.4 and 6.0.5)
5. If integrity is restored to a dry OTSG, then establish feedwater to the dry OTSG using EOP-14, Enclosure 3, Dry OTSG Recovery.
6. If a SBLOCA or RCS leak is in progress concurrent with a dry OTSG and OTSG shell temperature instruments are not available, then HPI flow may result in RCS cooldown limits being in excess of 3°F/ ½ hour on a dry OTSG. Minimize OTSG cooling on the intact OTSG and attempt to maintain RCS temperature above the minimum RCS temperature curve in Enclosure 1, Minimum RCS Temperature Curve if forced flow exists. The minimum RCS temperature curve was generated assuming forced flow exists.
7. Prior to recommending feeding a faulted OTSG, determine if additional steaming could result in personnel safety hazard or plant equipment damage.
8. If a feedwater or steam line failure has occurred in the Reactor Building, then ensure that Emergency RB Cooling is in service prior to initiating flow to a faulted OTSG. Monitor RB temperature and pressure during feeding.
9. If a LOCA is in progress, and a feedwater or steam line failure has occurred in the Reactor Building, then do not feed the faulted OTSG. Feeding the OTSG will result in dilution of the RB Sump recirculation fluid.
10. If a feedwater or steam line failure has occurred in the Reactor Building, and a LOCA is not in progress, then the RB sump pumps must remain in service to pump condensation from the Reactor Building sump. This may require bypassing ES and reopening WDV-3 and WDV-4. Begin processing water from the Miscellaneous Waste Storage Tank per OP-407R, Operations Involving MWST Processing via Waste Processing Demineralizer System, as soon as possible. Processing rates are 30 to 40 gpm.
11. Minimize subcooling margin based on Tincore to minimize tube pressure stresses.
12. Any source of feedwater flow to a dry OTSG must be established to the upper (EFW) nozzles to minimize tube stresses.

9.2 Guidelines For A Dry OTSG With Forced Flow

1. Plot RCS temperature (Tincore) versus time on Enclosure 1, Minimum RCS Temperature Curve to estimate tube to shell differential temperature. Tincore provides reliable indication of tube temperatures when RCPs are running. Use SPDS to determine incore temperature and Time=0 is based on when the OTSG boiled dry.
2. If SPDS is not available, then use average Tincore from the core exit chart recorders on the MCB to determine RCS temperature (RC-171-TR, RC-172-TR) for plotting RCS temperature versus time on Figure 1.
3. When at least one RCP is running and OTSG shell temperature instruments are not available for the dry OTSG, tube to shell delta T can be maintained within limits by cooling down the RCS at approximately 3°F/ ½ hour using the good OTSG. This cooldown rate is the estimated cooldown rate of the OTSG shell and will minimize differential thermal expansion between the tubes and shell.
4. If OTSG shell instrumentation is not available and the 3°F/ ½ hour rate is not achieved or is exceeded, then the cooldown for the following ½ hour must be adjusted accordingly (i.e., increase or decrease cooldown to achieve a 6°F temperature change over the total hour period).
5. Maintain Tincore above the "Min RCS Temp" curve shown in Enclosure 1, Minimum RCS Temperature Curve to prevent challenging the tensile limit of the tubes.
6. If RCS temperature approaches the "Min RCS Temp" limit, then stop or minimize the cooldown. This minimum temperature limit is only applicable when any RCP is operating.

9.3 Guidelines for a Dry OTSG with Natural Circulation

1. With no RCPs running, natural circulation will not exist in the loop with a dry OTSG. Since the reactor coolant in the affected OTSG tubes is stagnant, cooling the RCS at 3°F/ ½ hour will not be an effective means to minimize tube to shell delta T on the affected loop.
2. With no RCPs running, a dry OTSG may exceed tube to shell compressive limits if feeding does not occur within approximately 5 hours.
3. If forced flow is restored, then cooldown the RCS within ITS limits (see cooldown tables in EOPS) using the good OTSG to equalize RCS temperature (Tincore) with the estimated shell temperature from Enclosure 1, Minimum RCS Temperature Curve. Forced flow will provide a means to monitor and cooldown the idle OTSG. RCP restart guidance is included in EOP-14, Enclosure 16, RCP Recovery. Continue the RCS cooldown at a rate of approximately 3°F/ ½ hour unless instrumentation is available to monitor actual tube to shell temperature within limits and use the forced flow guidance in Section 9.2.
4. If an RCP cannot be started, then determine if the hot leg on the dry OTSG is saturated or subcooled by requesting a reading of the T_{sat} monitor in the Control Room when the loop is selected for "T_{hot}" or by use of the steam tables.

Subsection 9.3, Guidelines for a Dry OTSG with Natural Circulation (Cont'd)

5. If the dry OTSG hot leg is subcooled, and the steaming path is acceptable, then perform the following:
 - Establish EFW or AFW flow to the affected OTSG at ≤ 200 gpm in 1 line to initiate natural circulation through the idle loop.
 - Control flow to both the intact and faulted OTSG to prevent exceeding ITS cooldown rates.
 - Attempt to equalize T_{hot} with the estimated shell temperature of Enclosure 1 to limit the compressive tube to shell delta temperature.
 - Terminate flow to affected OTSG if steaming the faulted OTSG is causing a hazard to personnel or vital plant equipment.
 - If OTSG integrity is restored, then feed the dry OTSG per EOP-14, Enclosure 3 Dry OTSG Recovery.
 - Cooldown the RCS at approximately $3^{\circ}\text{F}/\frac{1}{2}$ hour to attempt to track the shell cooldown rate. The "Min RCS Temp" curve is not applicable with no RCP in operation.
 - When DH is established, then ensure high point vents are closed.
6. If the dry OTSG hot leg is saturated, and the steaming path is acceptable, then perform the following:
 - a. Estimate OTSG tube temperature on the faulted OTSG using T_{sat} of the primary side, based on RCS P_{sat} .
 - b. Stop the cooldown.
 - c. Ensure RB cooling is in service prior to opening high point vent valves. Opening the high point vents may result in Reactor Building Pressure reaching the ES actuation setpoint (4 psig nominal) and raise Reactor Building temperature.
 - d. Anticipate inventory makeup to the RCS and open the high point vent valves to reduce or eliminate the void.
 - e. Establish EFW or AFW flow to the affected OTSG at a rate of ≤ 200 gpm in 1 line for 1 minute.
 - f. If OTSG integrity is restored, then feed the dry OTSG per EOP-14, Enclosure 3, Dry OTSG Recovery.
 - g. If natural circulation cannot be induced and the faulted OTSG cannot repressurize, then do not reinitiate EFW unless the hot leg becomes subcooled due to natural circulation or by performance of Step 9.3.7.
 - h. If the hot leg does become subcooled, then follow the guidance in Step 9.3.5.
 - i. Cooldown the RCS at approximately $3^{\circ}\text{F}/\frac{1}{2}$ hour to attempt to track the shell cooldown rate. The "Min RCS Temp" curve is not applicable with no RCP in operation.

Subsection 9.3, Guidelines for a Dry OTSG with Natural Circulation (Cont'd)

7. If the dry OTSG hot leg remains saturated after feeding for 1 minute, or a safe steaming path is not available, then perform the following:
 - Consider opening the high point vent valves on the idle hot leg to limit the tube temperature if not already being performed.
 - Flow through the high point vent will allow cooler RCS to refill the hot leg and lower compressive tube stresses.
 - Opening the high point vent may result in Reactor Building Pressure reaching the ES actuation setpoint (4 psig nominal) and raise Reactor Building temperature.
 - Opening the high point vent may require HPI flow to prevent loss of subcooling margin based on Tincores.
 - RB cooling should be in service prior to opening high point vent valves.
 - If the hot leg becomes subcooled as a result of opening the high point vents, then close the high point vents and feed the Dry OTSG per Step 9.3.5.
 - If feeding the OTSG is not possible, then cycle the high point vents as required to continue a cooldown of the idle hot leg.
 - Cooldown the RCS at approximately 3°F/ ½ hour to attempt to track the shell cooldown rate. The "Min RCS Temp" curve is not applicable with no RCP in operation.

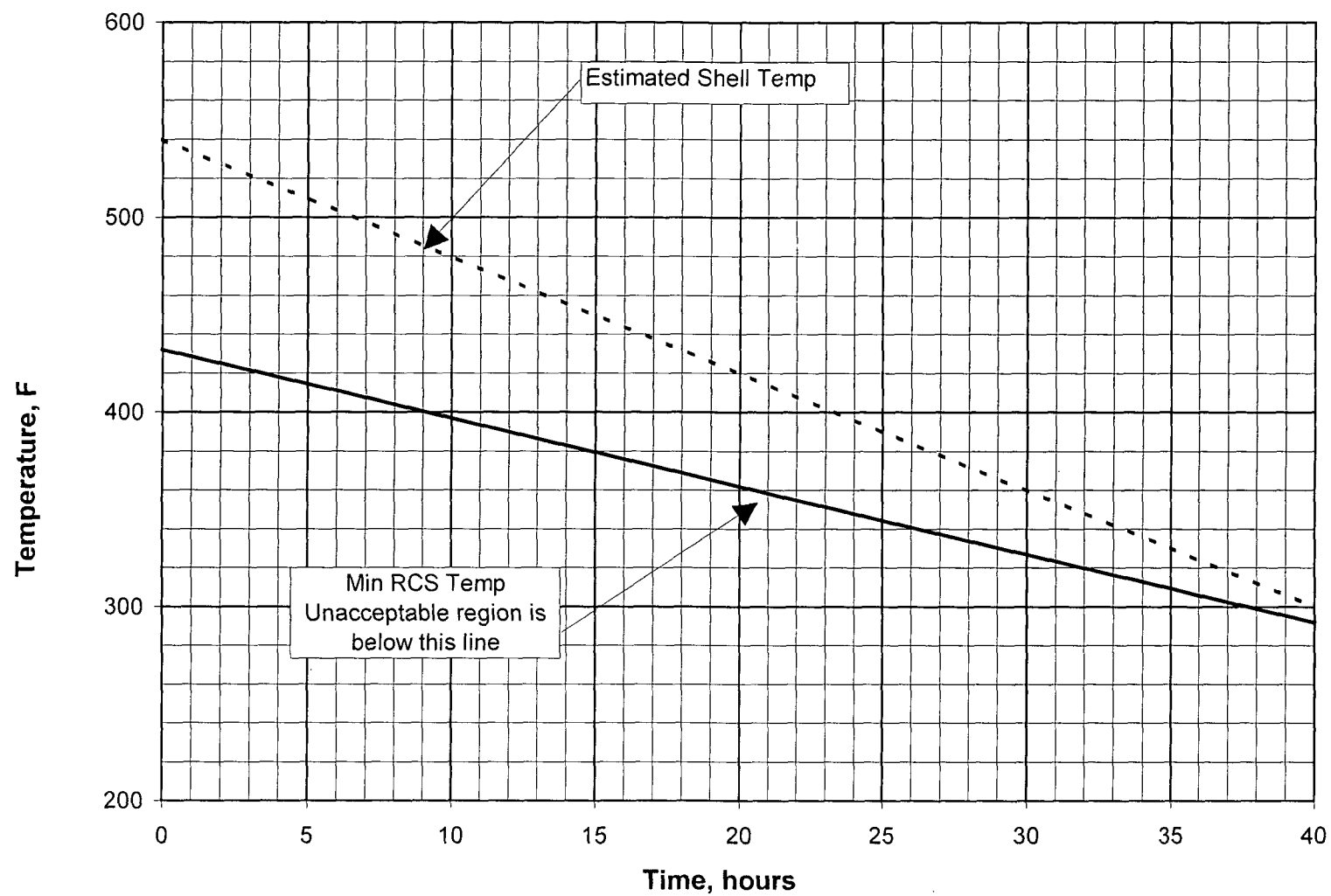
9.4 Guidelines For A Non-Dry OTSG To Maintain OTSG Tubes Within The Allowable Stress Limit

1. If either OTSG is not steaming, and ≥ 1 RCP running, and OTSG shell temperature instruments are not available for OTSG not Steaming, then ensure RCS is within allowable cooldown limits specified Enclosure 2, Maximum Allowable RCS Cooldown for Forced Flow with an Idle OTSG.
2. For all other conditions then ensure RCS is within required cooldown limits (see cooldown tables in EOPS).

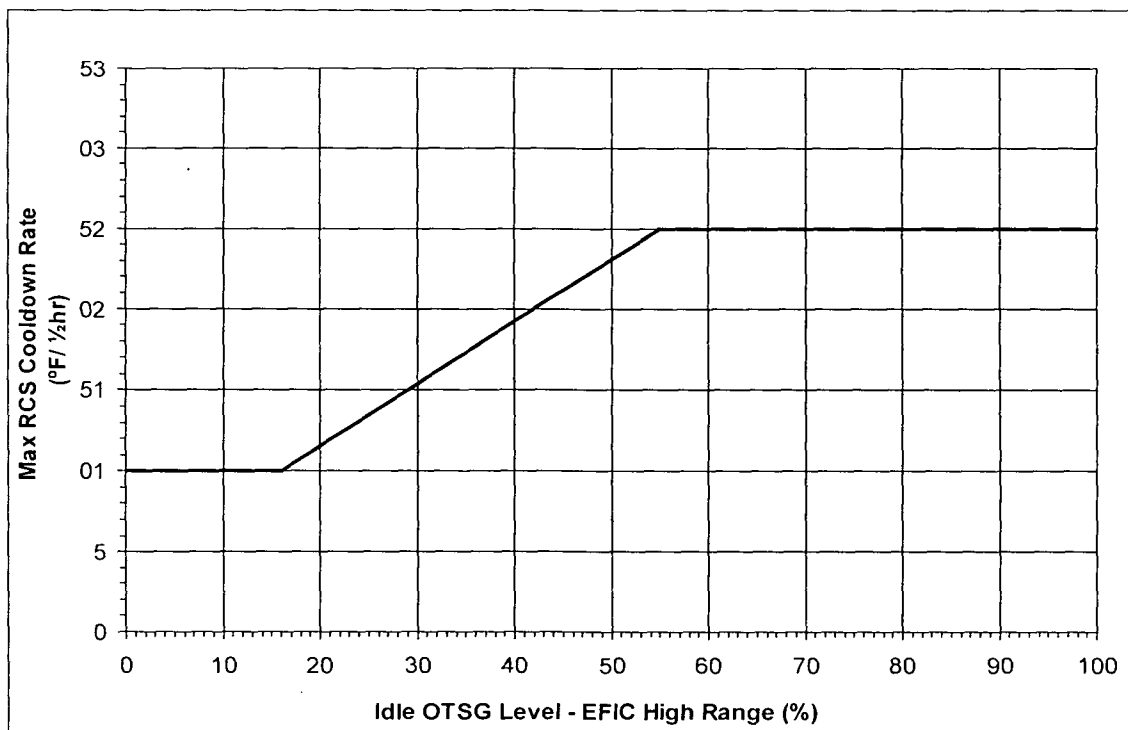
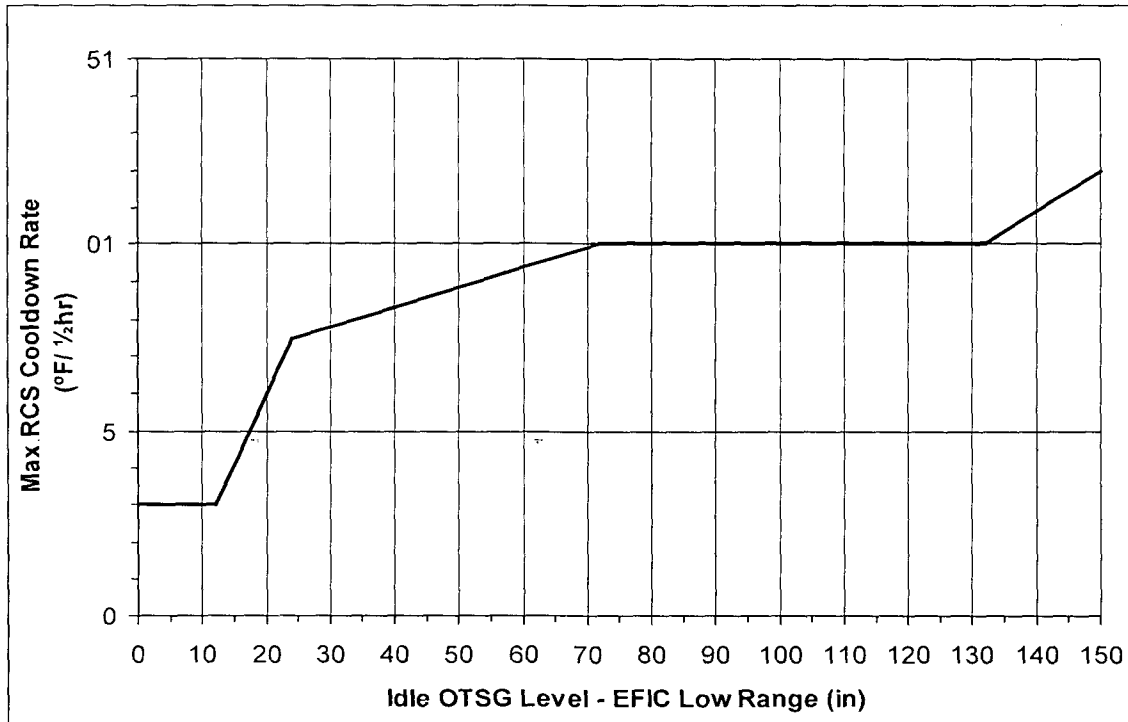
10.0 RECORDS

None

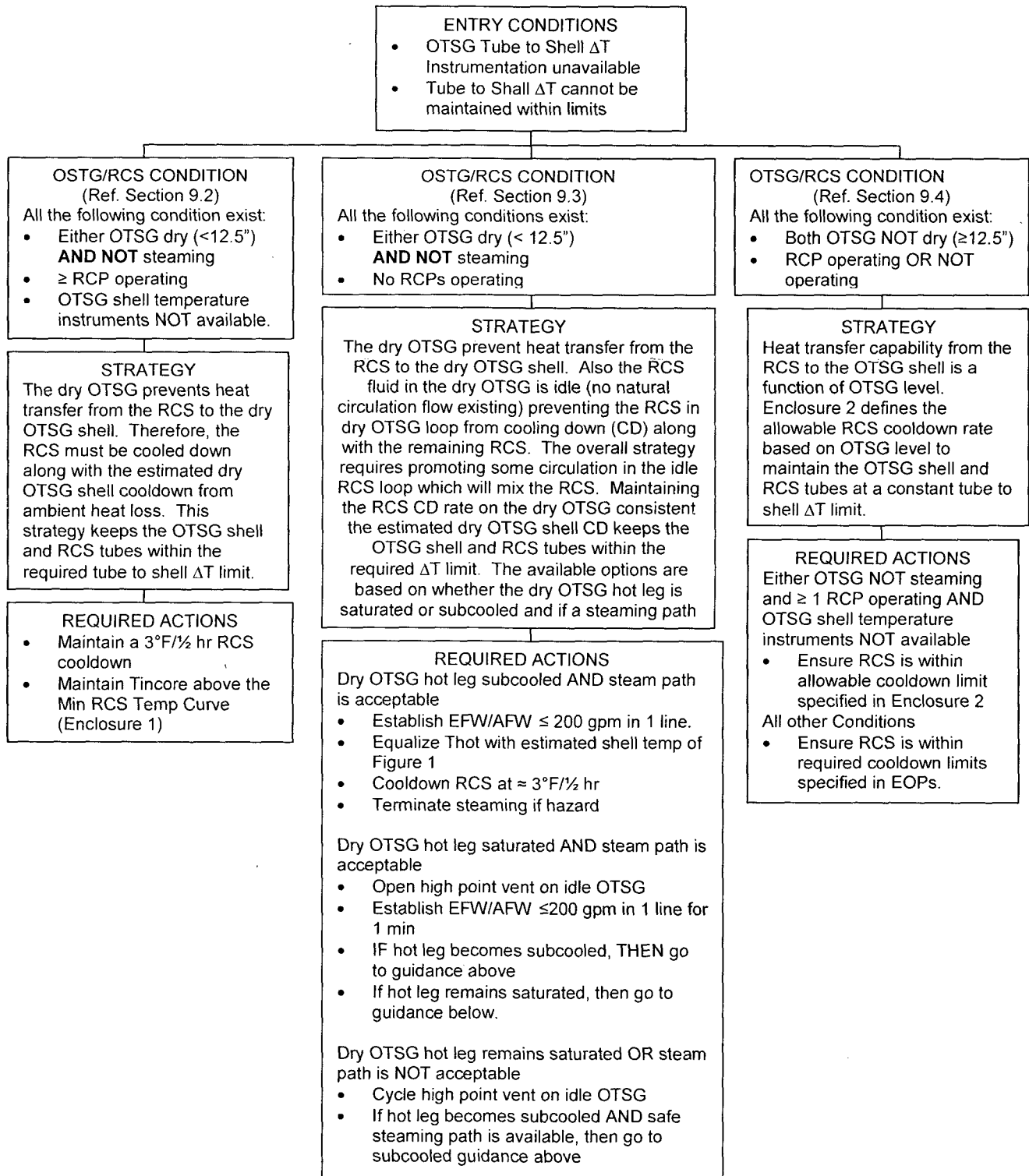
MINIMUM RCS TEMPERATURE CURVE



MAXIMUM ALLOWABLE RCS COOLDOWN FOR FORCED FLOW WITH AN IDLE OTSG



MITIGATION STRATEGY DIAGRAM



SUMMARY OF CHANGES
PRR 231009

- NOTES:** 1. Writers and Reviewers: Ensure that any changes to this procedure that affect information contained in ERF posters, enclosures, briefing cards, guidelines etc. are made to those items as well.
2. Writers and Reviewers: Changes to certain parts of this procedure may impact other EIPs. Ensure appropriate PRRs are initiated as needed.

| SECTION | CHANGE |
|--------------------|--|
| Throughout | reformatting IAW PRO-NGGC-0201 |
| Throughout | Figure 1 became Enclosure 1 Figure 2 became Enclosure 2 Figure 3 became Enclosure 3 |
| 1.0.3 | Added new purpose step stating "this procedure is an emergency plan implementing procedure. any revisions to this procedure must be carefully considered for emergency plan impact." (PRR 321655) |
| 2.2 | New implementing references section |
| 9.1.3 | Added new step stating "If any OTSG shell temperature computer points appear inaccurate then average the remaining accurate computer points for the effective OTSG to determine average temperature." (PRR 231009) |
| Summary of Changes | Added two new steps before summary of changes table (PRR 411915) |

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CRYSTAL RIVER UNIT 3
PLANT OPERATING MANUAL

EM-225E
GUIDELINES FOR LONG TERM COOLING

REVISION 11

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1.0 PURPOSE

1. The purpose of this procedure is to provide guidance to the TSC Accident Assessment Team for maintaining long term core cooling post LOCA.
2. This procedure is an emergency plan implementing procedure. Any revisions to this procedure must be carefully considered for emergency plan impact.

2.0 REFERENCES

2.1 Developmental References

1. Babcock and Wilcox Topical Report BAW-10103A, Rev. 3, ECCS Analysis of B&W's 177-FA Lowered-Loop NSS
2. Calculation M90-0021, Building Spray and Decay Heat Pump NPSH a/r
3. Calculation I97-0008, LPI Crossover Flow Loop Accuracy Calculation
4. Calculation I91-0001, DH (LPI) Flow Indication and Control Loop Error Calculation
5. Calculation M98-0003, TSC Guidance For LPI Cross-Connect (Framatome Technologies Document 51-5001075-01)
6. Framatome Technologies Document 74-1152414, Emergency Operating Procedures Technical Bases Document
7. Calculation I90-0021, Decay Heat Removal Heat Exchanger Outlet Temperature Loop Accuracy Calculation
8. Calculation I88-0011, Containment Sump and Building Flood Level Indication
9. Calculation I91-0012, BWST Level Accuracy
10. Calculation M94-0053, Allowable MUT-1 Indicated Overpressure vs. Indicated Level
11. Calculation M95-0005, Minimum BWST Level to Prevent Vortexing during Drawdown
12. MAR 90-06-10-02, Reactor Building Instrument and Valve Relocation
13. Calculation M90-0023, Reactor Building Flooding
14. Calculation F98-0015, Minimum HPI flow for CR-3 at 72 hours post-LOCA
15. EEM98-001, MU/HPI Pump Qualification
16. Calculation I89-0036, Make-up/HPI Flow Loop Accuracy (High Range)
17. Calculation I89-0037, Make-up/HPI Flow Loop Accuracy (Low Range)
18. EEI98-001, HPI Total Flow Uncertainty
19. BAW-2374, Rev.1, Risk-Informed Assessment of Once-Through Steam Generator Tube Thermal Loads due to Breaks in Reactor Coolant System Upper Hot Leg Large-Bore Piping.
20. Generic Letter 2004-02, Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors
21. EC 58982, Reactor Building Sump Strainer Modification
22. EC59476, RB Sump Level Instrumentation Modifications
23. EC 55315, Alternate AC Diesel Generator
24. EC 68809, Evaluation of RB Sump Backwashing Methods

2.2 Implementing References

1. EOP-13, EOP Rules
2. EOP-14, Emergency Operating Procedure Enclosure
3. OP-403B, Chemical Addition- Boric Acid System
4. OP-404, Decay Heat Removal System
5. OP-406, Spent Fuel Cooling System

3.0 DEFINITIONS

1. **Duration of Long Term Core Cooling:** The time period between the Onset of Long Term Core Cooling, and the End of ECCS Cooling.
2. **ECCS Suction Transfer:** This necessary operator action involves manual alignments to allow the active ECCS, and Reactor Building Spray components to take suction from the Reactor Building sump.
3. **Emergency Core Cooling Systems (ECCS):** Active components (i.e., High Pressure Injection, Low Pressure Injection, associated flow paths), combined with the passive systems (i.e., Core Flood Tanks (CFT) and the Borated Water Storage Tank), required to be operable to ensure the initial condition assumptions of the accident analysis are met.
4. **End of ECCS Cooling:** The time after a LOCA, when the core has been removed from the Reactor Vessel or other permanent means of core cooling has been established.
5. **Long Term Cooling Modes:** There are three methods that may be available for long term core cooling. The three methods in their order of preference are:
 - Both LPI trains operating and providing flow through their respective injection lines.
 - One LPI train operating and providing flow through its respective injection line, and providing a suction source for the associated HPI pump.
 - One LPI train operating and providing flow through both LPI injection paths through the discharge cross-tie line.
6. **Onset of Long Term Core Cooling:** The time after a LOCA, when operator action is required to ensure the ECCS systems are properly aligned, and the minimum performance requirements are met.

4.0 RESPONSIBILITIES

1. The TSC Accident Assessment Team is responsible for the following:
 - Monitoring ECCS system performance and providing recommendations to the EC regarding changes in the established flow paths.
 - Provide input to recovery plans for failed equipment, placing emphasis on the need for at least two ECCS injection paths before, during, and after required maintenance activities.
 - Assess plant conditions and equipment availability to determine the safest and most effective method to achieve LPI injection through both injection paths.

5.0 PREREQUISITES

None

6.0 PRECAUTIONS, LIMITATIONS, AND NOTES

1. To ensure adequate NPSH is maintained, total actual decay heat pump flow from RB sump must be maintained ≤ 2992 gpm. This is derived from the following:
 - LPI flow control set at 2000 gpm (2312 gpm including instrument uncertainties)
 - 580 gpm HPI flow (derived from hydraulic analysis)
 - 100 gpm LPI pump recirculation
2. Total HPI flow must be limited 72 hours post accident to ensure long term mission time requirements are met (reference section 9.2.3).
3. Any changes to the flow limits associated with Enclosure 4, A LPI Train Crosstie through Enclosure 10, Emergency LPI Crosstie and Piggyback Operations, must consider the following:
 - LPI pump NPSH
 - Instrumentation uncertainty
 - Required LPI flow
 - Required HPI flow
 - HPI pump mission time limitations
4. Do not perform LPI crosstie during boron precipitation mitigation activities.
5. Due to MOV considerations, limit bumps (motor starts) of the HPI valves to 5 consecutive times.
 - If more than 5 consecutive bumps are required, 1 bump may be performed every 7 minutes.
 - After a cooling period of 1.5 hours, 5 consecutive bumps may again be performed.
6. If piggyback operations are in progress, do not perform LPI crosstie until one of the following is met:
 - DHHE outlet temperature $\leq 130^{\circ}\text{F}$ and > 32 hours since shutdown.
 - DHHE outlet temperature $> 130^{\circ}\text{F}$ to $\leq 175^{\circ}\text{F}$ and > 81 hours since shutdown.
7. If the affected ES 4160V Bus is being powered by a diesel, then ensure adequate Diesel load margin is available per EOP-13, Rule 5, "Diesel Load Control" prior to starting equipment.
8. For work located in the Radiation Control Area, due consideration must be given to the ALARA program. This will likely result in special precautions and preparations.
9. If indicated RB water level exceeds 7.0 feet (RB elevation of 102ft), instrumentation may be lost (instrument uncertainty not included).
10. The HPI pump mission time study has qualified the pumps for a two month period. This analyzed mission time, relative to previous operational time, should be considered during decisions related to alignment changes.

7.0 SPECIAL TOOLS AND EQUIPMENT

None

8.0 ACCEPTANCE CRITERIA

None

9.0 INSTRUCTIONS

9.1 Emergency LPI Crosstie And Piggyback Operations

1. If HPI piggyback operations are required, and multiple failures result in the inability to align the ECCS systems for piggyback operation, then obtain EC concurrence and perform Enclosure 10, Emergency LPI Crosstie and Piggyback Operations.
2. If only HPI pumps are taking suction from the BWST, then level can be lowered to 2.5 feet (actual) or 3.5 feet (indicated).

9.2 Long Term Cooling Requirements

NOTE: Refilling the BWST will provide additional ECCS inventory for RCS injection in the unlikely event that severe RB Sump strainer blockage occurs.

1. As soon as possible after ECCS suction transfer is complete, perform the following:
 - Notify the OSC to begin refilling the BWST from the spent fuel pools by performing Enclosure 11, BWST Refill from SF Pool, of this procedure.
 - Notify OSC to commence Boric Acid production per OP-403B, Section 4.2
 - Start trending RB Sump Strainer blockage using RECL 79. An increasing trend could be indication of RB sump strainer blockage. Trend parameters could also be influenced by changes in sump water temperature, LPI flows and RB pressure.
 - Notify Control Room to adjust DHP-1A/1B low amp alarm to identify pump fluctuations (Ref OP-404 for guidance).
2. The most desired long term cooling mode of operation is to supply LPI injection through both injection lines. Review plant conditions for the safest method for achieving this alignment

Subsection 9.2, Long Term Cooling Requirements (Cont'd)

- NOTES:**
1. HPI can be terminated if LPI flow is > 1400 gpm in both LPI lines.
 2. The flow rates listed below will prevent HPI pump from exceeding maximum allowable flow and ensure continued core cooling for duration of mission.
 3. Loss of adequate SCM during establishment of the flow rates below is acceptable.
 4. The flow limits supersede the EOP requirement for full HPI after 64 hours.
 5. The lower flow limits ensure adequate core cooling beyond 64 hours when flow is not being supplied to the Rx through both LPI injection lines. This parameter is not relevant when RB sump blockage exists.
 6. Other configurations (recirc, seal injection, normal makeup) must be individually evaluated.
 7. Limiting the maximum allowable HPI flow at ≥ 64 hrs ensures the vendor requirement is not exceeded at 72 hrs.

3. When ≥ 64 hours have elapsed, then provide direction to the Control Room to maintain HPI flow within the following limits (balanced between available digital low range indicators):

| | ≥ 64 hours without Adequate SCM | ≥ 64 hours with Adequate SCM |
|-------------------------------|---|--|
| 1 HPI pump | > 440 gpm < 500 gpm | < 500 gpm |
| 2 HPI pumps (4 indicators) | > 440 gpm < 760 gpm | < 760 gpm |
| 2 HPI pumps (3 indicators) | > 440 gpm < 560 gpm | < 560 gpm |

4. After EOP-8A has been completed, request Control Room trending of the operating components by performance of:
 - Enclosure 1, ECCS Flow Log, every 24 hours
 - Enclosure 2, Long Term Cooling Equipment Log, every 12 hours

9.3 RB Water Level Control

1. Monitor and maintain the RB water level in the appropriate level limits. Consult with engineering personnel for the minimum and maximum levels for current plant conditions. (Reference Section 6.9, Calculation M90-0023 and Calculation M90-0021)
2. If RB water level is lowering, perform walk downs of accessible areas to determine leakage location. If the AB is not accessible, the Control Room radiation monitoring reading may be helpful in determination.

| |
|--|
| NOTE: Analysis indicates that a large break LOCA may result in steam generator tube failure due to stresses induced by tube to shell differential temperatures. |
|--|

3. If RB water level is lowering and no AB leakage exists consider the following:
 - Inadvertent pumping, i.e., RB sump pumps, RCDT pumps
 - Leaking ECCS flow path isolation valves, i.e., DHP recirc to BWST, DHP recirc to SF pools, HPI pump recirc to MUT, RB spray recirc to BWST, etc.
 - Possible SGTR
4. If the leaking component is found, review available equipment to determine possible Long Term Core Cooling alignments to allow faulted equipment isolation.
5. If RB water level loss has occurred consult with engineering personnel to ensure remaining ECCS water inventories (RB sump and BWST) are sufficient to support Long Term Core Cooling.
6. If ECCS water supplies are insufficient to support Long Term Core Cooling then, make preparations to initiate BWST makeup from an available source.
 - Spent Fuel Pool (refer to OP-406)
 - DW/boric acid addition (refer to OP-403B)
7. Reduction in RB sump boron concentration may be indicative of the need to perform boron precipitation mitigation.
8. Rising RB water level and lowering boron concentration may be indicative of unborated water leaking to containment. The following are possible sources of unborated water:
 - SW system
 - CI system
 - DW system
 - FW systems (AFW, EFW, MFW)
 - DC system via DHHEs
9. RB sump boron concentration must be maintained to ensure the Rx remains shutdown. If unborated water is leaking into the RB, attempt isolation efforts.

10. If RB sump water must be drained/pumped to prevent exceeding RB flood plane, then the storage location must be evaluated to prevent excessive dose rates and releases.

9.4 Long Term Core Cooling Mode Alignment Changes

1. The most desired long term cooling mode of operation is to supply LPI injection through both injection lines.
2. Enclosure 3, Operator Enclosure Functional Goals, describes the "Functional Goals" of the alternate cooling modes established by Enclosure 4, A LPI Train Crosstie, through Enclosure 10, Emergency LPI Crosstie and Piggyback Operations, of this procedure.
3. If power failures exist, then using OP-700 series procedures to ensure required equipment is energized.
4. During transitions to LPI crosstie mode of operation, the Control Room will ask for TSC assistance for HPI termination. Ensure all the following exist prior to allowing HPI pump shutdown:
 - Stable LPI crosstie flow within the limits of the applicable enclosure.
 - Tincore is **NOT** rising.
 - RCS pressure is **NOT** rising.
5. If the above conditions are not observed, direct the Control Room to re-establish HPI injection flow by performing the following:
 - a. Throttle the injection valves until total injection flow is > minimum pump flow.
 - b. Close the recirc valves.
 - c. Establish maximum allowable injection flow.
6. During LPI crosstie operations, if stable LPI flow within the limits of the applicable enclosure cannot be maintained, provide direction to the Control Room to establish HPI piggyback.
 - If Enclosure 8, Establishing A Train Piggyback or Enclosure 9, Establishing B Train Piggyback are used to establish piggyback, the status statement will not be met. The two status statements regarding LPI system alignment are intended for normal transitions with adequate core cooling.
 - Provided the associated LPI train indicated flow is ≤ 2100 gpm, adequate NPSH margin exists for HPI pump operation.
7. If RB water level losses threaten the ability to maintain Long Term Core Cooling, then, consider establishing core cooling using normal decay heat removal.

9.5 Maintenance during Long Term Cooling

1. Prior to performing maintenance activities, any necessary temporary shielding must be installed, and the associated piping flushed.
2. Storage location for draining and flushing operations must be evaluated to prevent excessive dose rates and releases.
3. A possible flushing activity may be to drain or pump water from the BWST or SF pools to a suitable storage location.

9.6 Contingency Actions for RB Sump Strainer Blockage [NOCS 100408, 100483, 100504]

CAUTIONS

1. Contingency actions contained in EOP-14, Enclosure 19 mitigate symptoms of RB sump strainer blockage by significantly reducing ECCS flow through the sump strainer. As long as ECCS pumps are aligned to the RB sump, the potential for further blockage exists.
2. Actions specified in this section are outside the CR3 design basis and must be performed in accordance with 10 CFR 50.54 sections X and Y.

1. If notified by the control room that indications of RB sump strainer blockage have occurred, then perform the following:
 - Notify EC that sump blockage has occurred.
 - Notify the OSC to expedite BWST refill operations (Enclosure 11, BWST Refill from SF Pool, and Enclosure 12, SF Pool Refill).
 - Ensure Boric Acid production is in progress per OP-403B.

- NOTE:**
1. RCITS reactor vessel level instrumentation indicates the water level from the top of the reactor vessel head to the bottom of the hot leg. A hot leg or cold leg LOCA in the nozzle belt region may result in no indicated reactor vessel level even with full ECCS flow rate.
 2. ECCS flow may impact RCITS reactor vessel level indication.

2. [AAT] Closely monitor RCS / ECCS conditions:
 - RB Sump level indication
 - RB Sump strainer ΔP (Ref RECL 79)
 - ECCS pump flow rates for symptoms of cavitation/ vortexing
 - RCS incore temperature trends
 - RCS subcooling margin
 - RCITS reactor vessel level indication
 - RB pressure / temperature
 - RB radiation levels / Iodine activity

Subsection 9.6, Contingency Actions for RB Sump Strainer Blockage [NOCS 100408, 100483, 100504] (Cont'd)

3. If RB spray is in operation (per EOP-14, Enclosure 19), then consult with engineering personnel and dose assessment to determine if alternate shutdown criteria can be established.
- Consider actual plant radiation levels.
 - Consider RB atmospheric I^{131} trend (if available).
 - Consider status of ECCS systems and Incore thermocouple trends. If ECCS systems are functioning normally and Incore trends indicate adequate core cooling the potential for a delayed release is low.
 - Consider the projected offsite thyroid dose from airborne RB releases. If the dose projection exceeds 5 REM thyroid, RB spray should be maintained, if possible, to reduce RB Iodine concentrations (the 5 REM limit should preserve DBA assumptions for both dose and CR Habitability calculations).
 - If containment temperature / pressure are elevated consider using two RB cooling units (in ES mode) in lieu of RB spray.

| |
|--|
| NOTE: LPI instrument uncertainty becomes significant at LPI flows < 800 gpm |
|--|

4. If indications of sump blocking exist, and LPI has been throttled using EOP-14, Enclosure 19, then provide direction to the Control Room to further reduce ECCS injection flow per the following guidance:
- Throttle ECCS flow as required to achieve a stable operating point.
 - If both LPI trains are in operation, and LPI flow is < 800 gpm, and HPI is available for piggy back mode, then establish HPI piggy back mode per Enclosure 8, Establishing A Train Piggyback or Enclosure 9, Establishing B Train Piggyback and stopping one train of LPI.
 - If only one train of ECCS is in operation, and HPI is operating in piggy back mode, then direct the control room to fully open all available HPI valves and close the associated LPI throttle valve (DHV-110/111).
 - Closely monitor ECCS pump parameters, Incore temperatures, and RB Sump strainer ΔP .

CAUTIONS

1. If ECCS suction must be realigned to the BWST, ECCS flow rates significantly greater than two times W_{VAP} are undesirable since they will accelerate BWST depletion.
2. Because break location is unknown ECCS flow must be injected through at least 2 nozzles.
3. 200 gpm minimum HPI flow allows MUP recirculation valves to remain closed.

5. If previous actions for RB sump blockage are not effective, and HPI is operating in piggyback mode with the associated LPI throttle valve closed (DHV-110/111) and all available HPI valves cannot be maintained fully open, then provide direction to the Control Room to reestablish ECCS injection flow from the BWST per the following guidance:

- Ensure BWST level sufficient to support HPI pump operation (>3.5 ft).
- Align one HPI pump to BWST per Enclosure 14, HPI from BWST during RB Sump Strainer Blockage.
- Maintain ECCS total flow rate two times W_{VAP} (Enclosure 13, Minimum ECCS Flows Required to Remove DH) or 200 gpm (Whichever is greater).
- Direct the Control Room to divide ECCS flow evenly between all available HPI nozzles.
- Closely monitor ECCS pump parameters and Incore temperatures
- When HPI flow from BWST has been established, then calculate time to BWST depletion based on initial BWST level and HPI flow rate.

$$[\text{Depletion Time (min)} = ((\text{Initial BWST level (ft)} - 3.5 \text{ ft}) \times 9400 \text{ gal/ft}) / \text{HPI flow rate}]$$

- Notify control room of minimum allowable BWST level to support HPI pump operation at current flow rate 2.5 feet (actual) or 3.5 feet (indicated).
- Reg. Guide 1.97 instrumentation may be submerged by the additional inventory, and may subsequently fail. Consult with engineering personnel to predict potential instrument failures and identify any available alternate instrumentation.
- Additional borated water inventory may adversely affect RB sump water chemistry. Consult with chemistry and engineering personnel to develop a plan for maintaining RB water chemistry within expected post accident range.

CAUTION

The LPI pumps shall **NOT** be running when backwashing the RB sump strainer. This will reduce the effectiveness of cleaning the RB sump strainer and possibly affect the operation of the LPI pump.

6. If ECCS injection flow has been reestablished from the BWST, or as directed by the TSC based on equipment failures, then provide direction to the Control Room to backwash the RB Sump strainer using one of the methods defined below:
 - a. Backwashing using gravity flow from the BWST to the RB sump.
 - The water force from gravity draining the BWST through the RB sump strainer can remove debris on the strainer. The effectiveness will be based on the BWST level and RB pressure. This method is more effective for conditions where a high BWST level is available (> 10 ft) and a low RB pressure exist (<10 psig). Flow path for this method is through DHV-34/35 and DHV-42/43. DHV-34/35 stroke time is approximately 10 sec. With the maximum estimated flow (high BWST level/low RB pressure), the BWST level could drop approximately ½ ft.
 - Advantages:
 - Can be used if DH dropline is **NOT** available.
 - Disadvantages:
 - Depletes available BWST inventory
 - Requires both ES electrical trains energized.
 - Limitation:
 - RB pressure is < 10 psig
 - Do **NOT** operate HPI pump from the train that is being used to gravity drain to the RB sump.
 - BWST level > 7 ft
 - Procedural Guidance:
 - Perform Enclosure 15, RB Sump Backwashing using BWST, in this procedure.

Subsection 9.6, Contingency Actions for RB Sump Strainer Blockage [NOCS 100408, 100483, 100504] (Cont'd)

Step 9.6.6 (Cont'd)

- b. Backwashing using gravity flow from the RCS to the RB sump using the DH drop line.
 - The water force from gravity draining the RCS through the RB sump strainer can remove debris on the strainer. The effectiveness will be based on the height of the RCS water level. This method is more effective for hot leg breaks where level exists in the hot legs, but the height of the drop line alone can remove some debris. The flow path for this method is from the DH dropline (DHV-3, DHV-4 DHV-41) through DHV-39/DHV-40 and DHV-42/43. DHV-42/43 will be pre-throttled to limit the flow. DHV-39/40 stroke time is approximately 90 sec.
 - Advantages:
 - Does **NOT** reduce the amount of BWST inventory that is available to supply water to the RCS.
 - No additional water inventory added to RB that could result in exceeding initial RB flood elevation.
 - Disadvantages:
 - Not as effective if break location is below drop line connection to RCS (elevation 126'-6").
 - Limitation:
 - Both ES electrical trains energized.
 - Procedural Guidance:
 - Perform Enclosure 16, RB Sump Backwashing using DH Drop Line, in this procedure.

Step 9.6.6 (Cont'd)

- c. Backwashing using gravity flow from the Spent Fuel Pool.
 - The water force from gravity draining from the Spent Fuel Pool through the RB sump strainer can remove debris on the strainer. This method is a more effective than gravity draining the BWST and possibly the DH dropline because of the elevation of the Spent Fuel Pool. The flow path for this method is from the SF Pool through SFV-89, DHV-39/40 and DHV-42/43. DHV-39/40 stroke time is approximately 90 sec. With the maximum estimated flow (high SF pool level/low RB pressure), the SF Pool level could drop approximately 1 ft.
 - Advantages:
 - Separate source of water
 - **NOT** directly tied to the RCS or operating ECCS pumps
 - Disadvantages:
 - Requires valve manipulation in the Aux building that could involve high radiation dose rates.
 - Limitation:
 - Radiation dose due to valve manipulation in Aux Building
 - SFP level > 156' 0"
 - SF system in normal alignment
 - BWST fill **NOT** in progress from SFP
 - Procedural Guidance
 - Perform Enclosure 17, RB Sump Backwashing using Gravity Flow from Spent Fuel Pool, in this procedure.

Step 9.6.6 (Cont'd)

d. Backwashing using the Spent Fuel Pumps flow.

- The spent fuel pump can be used remove debris on the RB sump strainer. This method is a more effective than gravity draining for high RB pressure conditions which could limit backwash flow. The flow path for this method is from the SF pool through the SF pump and discharging through SFV-85, DHV-39/40 and DHV-42/43. DHV-39/40 stroke time is approximately 90 sec. The maximum estimated spent fuel pump flow (high SF pool level/low RB pressure) is approximately 750 gpm.
- Advantages:
 - Separate source of water
 - Better flow control with SF pumps
 - **NOT** directly tied to the RCS or operating ECCS pumps
- Disadvantages:
 - Requires valve manipulation in the Aux building that could involve high radiation dose rates.
- Limitation:
 - Radiation dose due to valve manipulation in Aux Building
 - SFP level > 156' 6"
 - SF system in normal alignment
 - BWST fill **NOT** in progress from SFP
- Procedural Guidance:
 - Perform Enclosure 18, RB Sump Backwashing using Spent Fuel Pump, in this procedure in this procedure.

Subsection 9.6, Contingency Actions for RB Sump Strainer Blockage [NOCS 100408, 100483, 100504] (Cont'd)

7. If RB sump strainer has been backwashed, then provide direction to the Control Room to reestablish RB sump flow after cleaning RB sump strainer.
 - If the RB sump becomes blocked due to RB debris and RB sump strainer has been cleaned, then re-establishing RB sump flow rates should be limited to a flow rate that is as low as possible to prevent re-blocking the RB sump. Start a LPI pump from the RB sump and slowly increase flow to approximately 600 gpm while maintaining flow from the BWST using HPI pumps. If indication of RB sump blockage does not exist, then the following additional options are available:
 - Refer to Enclosure 19, Re-Establish LPI Flow from the RB Sump, in this procedure for guidance on reestablishing flow after cleaning:
 - a. Transfer to piggyback and maintain all LPI flow through the HPI pumps (close DHV-110/111). Ensure flow is maintained through all available HPI injection nozzles.
 - Advantages-Maintaining a piggyback configuration ensures flow is maintained to the RCS with better instrument uncertainty.
 - Disadvantages-Piggyback configuration could impact both LPI and HPI pumps if RB sump blockage re-occurs.
 - b. Start second LPI pump from the RB sump and increase flow to approximately 600 gpm. Monitor for indication of RB sump strainer blockage. If strainer blockage does not exist stop HPI pump from BWST. Adjust LPI flow as required based on decay heat levels and instrument uncertainty.
 - Advantages-
 - Ensures adequate flow to the RCS by maintaining two independent flow paths.
 - Eliminates the likelihood of the HPI pump being affected by RB sump blockage.
 - Disadvantages-Higher flow rate through the RB sump strainer can increase the likelihood of RB sump blockage.
 - c. Stop HPI pumps and maintain single LPI Pump operating.
 - Advantages-Lower flow rates through RB sump strainer reduce the likelihood of RB sump blockage.
 - Disadvantages-Single flow path that could be influenced by core flood line break on the operating LPI pump.

Subsection 9.6, Contingency Actions for RB Sump Strainer Blockage [NOCS 100408, 100483, 100504] (Cont'd)

8. If RB sump blockage has occurred, then develop alternate sources of RCS injection for situations where the existing backwash methods are not effective. (Refer to the CR3 Severe Accident Guideline)
 - Consider aligning 1 HPI pump to MUT. Maintain MUT level by feeding from RCBTs and BASTs.
 - Consult with engineering personnel to determine minimum acceptable HPI flow rate. Maintain injection flow rate $\geq W_{VAP}$ (Enclosure 13, Minimum ECCS Flows Required to Remove DH).
 - If CFTs were isolated before being fully depleted, consider reopening CF isolation valves.
 - Consult with engineering personnel to determine if plant conditions will support a transition to DHR.

9.7 **Long Term Cooling Termination**

1. When the end of ECCS cooling occurs, then exit this procedure.

10.0 **RECORDS**

The enclosures of this procedure are quality records.

ECCS FLOW LOG

[illegible]

Note (1) – Suggested minimum time interval is 24 hours.

(2) – If an increasing trend is noted without a corresponding decrease in RCS pressure or increase in valve position, notify the TSC.

(3) – HPI flows must be maintained within the limits of Section 9.2

LONG TERM COOLING EQUIPMENT LOG

| DHP-1A Computer Points (1) | | | | | | | | | |
|----------------------------|--|--|--|--|--|--|--|--|--|
| R250 | | | | | | | | | |
| X318 | | | | | | | | | |
| X319 | | | | | | | | | |
| X320 | | | | | | | | | |

| DHP-1B Computer Points (1) | | | | | | | | | |
|----------------------------|--|--|--|--|--|--|--|--|--|
| R251 | | | | | | | | | |
| X321 | | | | | | | | | |
| X322 | | | | | | | | | |
| X323 | | | | | | | | | |

| MUP-1A Computer Points (1) | | | | | | | | | |
|----------------------------|--|--|--|--|--|--|--|--|--|
| X324 | | | | | | | | | |
| X326 | | | | | | | | | |
| X325 | | | | | | | | | |
| X070 | | | | | | | | | |
| X366 | | | | | | | | | |
| T217 | | | | | | | | | |
| S292 | | | | | | | | | |
| S294 | | | | | | | | | |

| MUP-1B Computer Points (1) | | | | | | | | | |
|----------------------------|--|--|--|--|--|--|--|--|--|
| X327 | | | | | | | | | |
| X329 | | | | | | | | | |
| X328 | | | | | | | | | |
| X071 | | | | | | | | | |
| X367 | | | | | | | | | |
| T253 | | | | | | | | | |
| S311 | | | | | | | | | |
| S295 | | | | | | | | | |

| MUP-1C Computer Points (1) | | | | | | | | | |
|----------------------------|--|--|--|--|--|--|--|--|--|
| X330 | | | | | | | | | |
| X332 | | | | | | | | | |
| X331 | | | | | | | | | |
| X072 | | | | | | | | | |
| A298 | | | | | | | | | |
| T236 | | | | | | | | | |
| T216 | | | | | | | | | |
| S296 | | | | | | | | | |

Note (1) – These instruments are NOT safety related or EQ qualified. However, this data may be useful for trending equipment condition.

LONG TERM COOLING EQUIPMENT LOG

| BSP-1A Computer Points (1) | | | | | | | | | |
|----------------------------|--|--|--|--|--|--|--|--|--|
| X313 | | | | | | | | | |
| X312 | | | | | | | | | |
| X314 | | | | | | | | | |

| BSP-1B Computer Points (1) | | | | | | | | | |
|----------------------------|--|--|--|--|--|--|--|--|--|
| X316 | | | | | | | | | |
| X315 | | | | | | | | | |
| X317 | | | | | | | | | |

Note (1) – These instruments are NOT safety related or EQ qualified. However, this data may be useful for trending equipment condition.

OPERATOR ENCLOSURE FUNCTIONAL GOALS

| Enclosure | Functional Goal |
|-----------|---|
| 4 | <p>To provide LPI flow through both injection lines using DHP-1A. This alignment allows maintenance on the following equipment:</p> <ul style="list-style-type: none"> • All HPI pumps • DHP-1B, provided the recirculation fluid downstream of DHV-111 does <u>NOT</u> result in excessive dose rates. <p>The only alignment that should be performed <u>from</u> this alignment is starting the opposite LPI train.</p> |
| 5 | <p>To provide LPI flow through both injection lines using DHP-1B. This alignment allows maintenance on the following equipment:</p> <ul style="list-style-type: none"> • All HPI pumps • DHP-1A, provided the recirculation fluid downstream of DHV-110 does <u>NOT</u> result in excessive dose rates. <p>The only alignment that should be performed <u>from</u> this alignment is starting the opposite LPI train.</p> |
| 6 | <p>To provide LPI flow through A Train LPI using DHP-1A. Provided DHP-1B is operating, this alignment allows maintenance activities on all HPI pumps.</p> |
| 7 | <p>To provide LPI flow through B Train LPI using DHP-1B. Provided DHP-1A is operating, this alignment allows maintenance activities on all HPI pumps.</p> |
| 8 | <p>To provide HPI injection using the A Train ES selected HPI pump. This alignment allows maintenance on the following equipment:</p> <ul style="list-style-type: none"> • Secured HPI pumps • DHP-1B |
| 9 | <p>To provide HPI injection using the B Train ES selected HPI pump. This alignment allows maintenance on the following equipment:</p> <ul style="list-style-type: none"> • Secured HPI pumps • DHP-1A |
| 10 | <p>To provide emergency alignments should Piggyback alignments fail.</p> |

A LPI TRAIN CROSSTIE

ACTIONS

DETAILS

STATUS

- ECCS suction transfer has been completed.
 - DHP-1A is operating.
 - A Train ES selected MUP is operating in piggyback.
 - BSP-1B is shutdown.
 - LPI crosstie NOT in progress.
 - DHHE outlet TEMP is $\leq 130^{\circ}\text{F}$ AND > 32 hours have elapsed since Rx shutdown.
- OR
- DHHE outlet TEMP is $> 130^{\circ}\text{F}$ to $\leq 175^{\circ}\text{F}$ AND > 81 hours have elapsed since Rx shutdown.

NOTE

Tincore should be closely monitored while changing ECCS alignments.

- 4.1 ____ Ensure B ES selected MUP is stopped.

____ MUP-1B

____ MUP-1C

- 4.2 ____ IF both LPI pumps are running,
THEN stop DHP-1B.

A LPI TRAIN CROSSTIE

ACTIONS

DETAILS

4.3 ____ Isolate B LPI Train.

- Ensure the following valves closed:

____ DHV-35

____ DHV-40

____ DHV-43

____ DHV-211

____ DHV-12

- ____ Select BSV-4 to "MAN" and closed.
- ____ Select DHV-111 to "MAN" and closed.

4.4 ____ Adjust DHV-110 setpoint to 1600 gpm.

A LPI TRAIN CROSSTIE

ACTIONSDETAILSNOTE

During crosstie DHV-111 must remain in manual.

- 4.5 ☐ Establish LPI crosstie.
- 1 ☐ Ensure DHV-6 is open.
- 2 ☐ Open LPI crosstie valves:
- ☐ DHV-8
- ☐ DHV-7
- 3 ☐ Throttle DHV-111 to achieve LPI crosstie flow of 900 (800 to 1000) gpm on DH-38-FI1
- 4 ☐ Adjust DHV-110 setpoint to obtain A Train LPI flow of 2000 (1900 to 2100) gpm on DH-1-FI1
-

- 4.6 ☐ IF HPI flow is > 300 gpm,
 THEN throttle HPI flow to
 300 (200 to 400) gpm.
-

- 4.7 ☐ Increase LPI flow
- 1 ☐ Throttle DHV-111 to achieve LPI crosstie flow of 900 (800 to 1000) gpm on DH-38-FI1
- 2 ☐ Adjust DHV-110 setpoint to obtain A Train LPI flow of 2100 (2000 to 2200) gpm on DH-1-FI1

A LPI TRAIN CROSSTIE

ACTIONSDETAILS

4.8 ____ Stop HPI flow.

1 Open all HPI recirc to sump valves:

____ MUV-543

____ MUV-544

____ MUV-545

____ MUV-546

2 Close all HPI valves:

____ MUV-23

____ MUV-24

____ MUV-25

____ MUV-26

4.9 ____ Monitor Tincore to ensure
RCS TEMP is NOT rising.

• ____ Contact TSC if RCS TEMP rises.

4.10 ____ WHEN the TSC directs
termination of the MUP,
THEN stop the operating
MUP.

1 Stop the A ES selected MUP:

____ MUP-1A

____ MUP-1B

2 ____ Close DHV-11

A LPI TRAIN CROSSTIE

ACTIONSDETAILSNOTE

During crosstie DHV-111 must remain in manual.

4.11 ____ Increase LPI flow.

1 ____ Throttle DHV-111 to obtain LPI
crosstie flow of 1250 (1150 to 1350)
gpm on DH-38-FI1

2 ____ Adjust DHV-110 setpoint to achieve
A Train LPI flow 2600
(2500 to 2700) gpm on DH-1-FI1

4.12 ____ Close all HPI recirc to sump
valves.

____ MUV-543

____ MUV-544

____ MUV-545

____ MUV-546

B LPI TRAIN CROSSTIE

ACTIONS

DETAILS

STATUS

- ECCS suction transfer has been completed.
- DHP-1B is operating.
- B Train ES selected MUP is operating in piggyback.
- BSP-1A is shutdown.
- LPI crosstie NOT in progress.
- DHHE outlet TEMP is $\leq 130^{\circ}\text{F}$ AND > 32 hours have elapsed since Rx shutdown.

OR

- DHHE outlet TEMP is $> 130^{\circ}\text{F}$ to $\leq 175^{\circ}\text{F}$ AND > 81 hours have elapsed since Rx shutdown.

NOTE

Tincore should be closely monitored while changing ECCS alignments.

5.1 ____ Ensure A ES selected HPI pump is stopped.

____ MUP-1A

____ MUP-1B

B LPI TRAIN CROSSTIE

ACTIONS

DETAILS

5.2 ☐ IF both LPI pumps are
 running,
 THEN stop DHP-1A

5.3 ☐ Isolate A LPI Train.

- Ensure the following are closed:

☐ DHV-34

☐ DHV-39

☐ DHV-42

☐ DHV-210

☐ DHV-11

- ☐ Select BSV-3 to "MAN" and closed.
 - ☐ Select DHV-110 to "MAN" and closed.
-

5.4 ☐ Adjust DHV-111 setpoint to
 1600 gpm.

B LPI TRAIN CROSSTIE

ACTIONSDETAILSNOTE

During crosstie DHV-110 must remain in manual.

5.5 ____ Establish LPI crosstie.

1 ____ Ensure DHV-5 is open.

2 Open LPI crosstie valves:

____ DHV-8

____ DHV-7

3 ____ Throttle DHV-110 to achieve LPI crosstie flow of 900 (800 to 1000) gpm on DH-38-FI1

4 ____ Adjust DHV-111 setpoint to achieve B Train LPI flow of 2000 (1900 to 2100) gpm on DH-1-FI2

5.6 ____ IF HPI flow is > 300 gpm,
THEN throttle HPI flow to
300 (200 to 400) gpm.

5.7 ____ Increase LPI flow

1 ____ Throttle DHV-110 to achieve LPI crosstie flow of 900 (800 to 1000) gpm on DH-38-FI1

2 ____ Adjust DHV-111 setpoint to obtain B Train LPI flow of 2100 (2000 to 2200) gpm on DH-1-FI2

B LPI TRAIN CROSSTIE

ACTIONSDETAILS

5.8 ____ Stop HPI flow.

1 Open all HPI recirc to sump valves:

____ MUV-543

____ MUV-544

____ MUV-545

____ MUV-546

2 Close all HPI valves:

____ MUV-23

____ MUV-24

____ MUV-25

____ MUV-26

5.9 ____ Monitor Tincore to ensure
RCS TEMP is NOT rising.

• ____ Contact TSC if RCS TEMP rises.

5.10 ____ WHEN the TSC directs
termination of the MUP,
THEN stop the operating
MUP.

1 Stop the B ES selected MUP:

____ MUP-1B

____ MUP-1C

2 ____ Close DHV-12

B LPI TRAIN CROSSTIE

ACTIONSDETAILSNOTE

During crosstie DHV-110 must remain in manual.

5.11 ____ Increase LPI flow.

1 ____ Throttle DHV-110 to achieve LPI
crosstie flow of 1250 (1150 to 1350)
gpm on DH-38-FI1

2 ____ Adjust DHV-111 setpoint to achieve
B Train LPI flow of 2600
(2500 to 2700) gpm on DH-1-FI2

5.12 ____ Close all HPI recirc to sump
valves.

____ MUV-543

____ MUV-544

____ MUV-545

____ MUV-546

STARTING A TRAIN LPI PUMP

ACTIONS

DETAILS

STATUS

- ECCS suction transfer has been completed.
- DHP-1B is operating.
- B Train ES selected MUP is operating in piggyback.

OR

- LPI crosstie in progress.

NOTE

Tincore should be closely monitored while changing ECCS alignments.

6.1 ____ Ensure proper alignment for the A Train LPI system.

1 Ensure the following valves are closed:

____ DHV-34

____ DHV-39

____ DHV-11

2 ____ IF LPI crosstie is NOT in progress,
THEN close DHV-110

3 ____ Ensure DHV-42 is open.

4 ____ Ensure DHV-5 is open.

STARTING A TRAIN LPI PUMP

ACTIONSDETAILS

6.2 ____ Start A Train LPI.

[Rule 5, Diesel Load Control]

1 Ensure required cooling pumps are operating:

____ DCP-1A

____ RWP-3A

2 ____ Start DHP-1A

3 ____ Ensure DHV-210 is open.

6.3 ____ IF LPI crosstie operations
are in progress,
THEN stop crosstie flow.

• Close LPI crosstie valves:

____ DHV-8

____ DHV-7

6.4 ____ Ensure LPI flow is properly
controlled.• Ensure LPI control valves are in "AUTO"
and set for 2000 gpm:

____ DHV-110

____ DHV-111

STARTING A TRAIN LPI PUMP

ACTIONSDETAILS6.5 ____ WHEN all the following exist:____ A Train LPI flow > 1400
gpm____ B Train LPI flow > 1400
gpmTHEN stop HPI.

1 Stop B ES selected MUP:

____ MUP-1B

____ MUP-1C

2 ____ Close DHV-12

STARTING B TRAIN LPI PUMP

ACTIONSDETAILSSTATUS

- ECCS suction transfer has been completed.
 - DHP-1A is operating.
 - A Train ES selected MUP is operating in piggyback.
- OR
- LPI crosstie in progress.

NOTE

Tincore should be closely monitored while changing ECCS alignments.

7.1 ____ Ensure proper alignment for
the B Train LPI system.

1 Ensure the following valves are closed:

____ DHV-35

____ DHV-40

____ DHV-12

2 ____ IF LPI crosstie is NOT in progress,
THEN close DHV-111

3 ____ Ensure DHV-43 is open.

4 ____ Ensure DHV-6 is open.

STARTING B TRAIN LPI PUMP

ACTIONSDETAILS

7.2 ____ Start B Train LPI.

[Rule 5, Diesel Load Control]

1 Ensure required cooling pumps are operating:

____ DCP-1B

____ RWP-3B

2 ____ Start DHP-1B

3 ____ Ensure DHV-211 is open.

7.3 ____ IF LPI crosstie operations
are in progress,
THEN stop crosstie flow.

• Close LPI crosstie valves:

____ DHV-8

____ DHV-7

7.4 ____ Ensure LPI flow is properly
controlled.• Ensure LPI control valves in "AUTO"
and set for 2000 gpm:

____ DHV-110

____ DHV-111

STARTING B TRAIN LPI PUMP

ACTIONSDETAILS7.5 ____ WHEN all the following exist:____ A Train LPI flow > 1400
gpm____ B Train LPI flow > 1400
gpmTHEN stop HPI.

1 Stop A ES selected MUP:

____ MUP-1A

____ MUP-1B

2 ____ Close DHV-11

ESTABLISHING A TRAIN PIGGYBACK

ACTIONSDETAILS**STATUS**

- ECCS suction transfer has been completed.
- Both LPI trains are operating and providing flow.
- LPI crosstie NOT in progress.

NOTE

Tincore should be closely monitored while changing ECCS alignments.

8.1 ____ Ensure proper HPI alignment.

1 MUP recirc to MUT valves closed:

____ MUV-53

____ MUV-257

2 HPI recirc to sump valves closed:

____ MUV-543

____ MUV-544

____ MUV-545

____ MUV-546

3 HPI valves are open or throttled as directed by the TSC:

____ MUV-23

____ MUV-24

____ MUV-25

____ MUV-26

ESTABLISHING A TRAIN PIGGYBACK

ACTIONS

DETAILS

8.2 ____ Align DHP-1A discharge to
MUP suction.

- ____ Open DHV-11

8.3 ____ Ensure DHP-1A flow is within
limits.

- ____ Ensure DHV-110 in "AUTO" and set
for 2000 gpm.

8.4 ____ Start A Train HPI.
[Rule 5, Diesel Load Control]

- Start the A ES selected MUP and
required cooling pumps:

____ MUP-1A

____ MUP-1B

8.5 ____ Stop B Train ECCS pumps.

- 1 Ensure the B ES selected MUP
stopped:

____ MUP-1B

____ MUP-1C

- 2 ____ Ensure DHP-1B is stopped.

- 3 ____ Close DHV-12

- 4 ____ Close DHV-6

ESTABLISHING A TRAIN PIGGYBACK

ACTIONSDETAILS

8.6 — IF ≥ 64 hrs post accident,
THEN ensure HPI flow is
within limits
(use digital low range).

- — IF adequate SCM does NOT exist,
THEN throttle HPI flow to 470 gpm
(440 to 500 gpm).

- — IF adequate SCM exists,
THEN throttle HPI flow to
< 500 gpm.

8.7 — IF < 64 hrs post accident,
THEN ensure HPI flow is
within limits
(use digital low range).

- — IF adequate SCM does NOT exist,
THEN establish full HPI.

- — IF adequate SCM exists,
THEN throttle HPI to maintain
minimum adequate SCM.

ESTABLISHING B TRAIN PIGGYBACK

ACTIONSDETAILS**STATUS**

- ECCS suction transfer has been completed.
- Both LPI trains are operating and providing flow.
- LPI crosstie NOT in progress.

NOTE

Tincore should be closely monitored while changing ECCS alignments.

9.1 ____ Ensure proper HPI alignment.

1 MUP recirc to MUT valves closed:

____ MUV-53

____ MUV-257

2 HPI recirc to sump valves closed:

____ MUV-543

____ MUV-544

____ MUV-545

____ MUV-546

3 HPI valves are open or throttled as directed by the TSC:

____ MUV-23

____ MUV-24

____ MUV-25

____ MUV-26

ESTABLISHING B TRAIN PIGGYBACK

ACTIONSDETAILS

9.2 ____ Align DHP-1B discharge to
MUP suction.

• ____ Open DHV-12

9.3 ____ Ensure DHP-1B flow is within
limits.

• ____ Ensure DHV-111 in "AUTO" and set
for 2000 gpm.

9.4 ____ Start B Train HPI.
[Rule 5, Diesel Load Control]

• Start the B ES selected MUP and
required cooling pumps:

____ MUP-1B

____ MUP-1C

9.5 ____ Stop A Train ECCS pumps.

1 Ensure the A ES selected MUP is
stopped:

____ MUP-1A

____ MUP-1B

2 ____ Ensure DHP-1A is stopped.

3 ____ Close DHV-11

4 ____ Close DHV-5

ESTABLISHING B TRAIN PIGGYBACK

ACTIONSDETAILS

-
- 9.6 IF ≥ 64 hrs post accident,
 THEN ensure HPI flow is
 within limits
 (use digital low range).
- IF adequate SCM does NOT exist,
 THEN throttle HPI flow to 470 gpm
 (440 to 500 gpm).
 - IF adequate SCM exists,
 THEN throttle HPI flow to
 < 500 gpm.
-
- 9.7 IF < 64 hrs post accident,
 THEN ensure HPI flow is
 within limits
 (use digital low range).
- IF adequate SCM does NOT exist,
 THEN establish full HPI.
 - IF adequate SCM exists,
 THEN throttle HPI to maintain
 minimum adequate SCM.

EMERGENCY LPI CROSSTIE AND PIGGYBACK OPERATIONS

ACTIONSDETAILSSTATUS

- At least 1 LPI pump is operating.
- Multiple failures have resulted in the inability to establish Piggyback.

10.1 IF all the following exist:

 LPI flow exists

 Only 1 LPI train is operating

THEN crosstie LPI trains.

1 Ensure DHP isolation valve on idle train is closed:

 DHV-210 (A Train)

 DHV-211 (B Train)

2 Ensure LPI block valve on idle train is open:

 DHV-5 (A Train)

 DHV-6 (B Train)

3 Ensure LPI control valve on idle train is closed:

 DHV-110 (A Train)

 DHV-111 (B Train)

4 Open LPI crosstie valves:

 DHV-8

 DHV-7

5 Establish the following flows using DHV-110 and DHV-111:

 LPI crosstie flow
1250 (1150 to 1350) gpm
on DH-38-F11

 Operating LPI train flow
2600 (2500 to 2700) gpm

EMERGENCY LPI CROSSTIE AND PIGGYBACK OPERATIONS

ACTIONSDETAILS

10.2 ____ IF RCS PRESS prevents
LPI flow,
THEN establish alternate
piggyback alignment.

- Open the necessary valves:

____ DHV-11

____ DHV-12

____ MUV-62

____ MUV-69

BWST REFILL FROM SF POOL

ACTIONS

DETAILS

STATUS

BWST refill from SF Pool desired.

- 11.1 ____ Establish SF cooling with
SFP-1A and SFHE-1A per
OP-406.

[Rule 5, Diesel Load Control]

-
- 11.2 ____ Verify SF pool boron
concentration ≥ 2270 ppm.

BWST REFILL FROM SF POOL

ACTIONSDETAILS

11.3 ____ Align SFP-1B for BWST refill.

1 ____ Ensure SFP-1B stopped

2 Ensure the following valves are closed:

____ SFV-12
"SFP COMMON SUCTION
ISOLATION"

____ SFV-34
"SFP-1A/1B DISCHARGE
CROSSTIE"

____ SFV-35
"SFP-1A/1B DISCHARGE
CONTROL TO FUEL TRANSFER
CANAL"

____ SFV-43
"SFHE-1A/1B TO SFFL-1A/1B
ISOLATION"

____ SFV-50
"SFHE OUTLET CROSSTIE"

____ SFV-87
"DHP TO SFFL-1A/1B ISOLATION"

____ SFV-89
"SPENT FUEL HEADER TO DHP
SUCTION ISOLATION"

3 Ensure the following valves are open:

____ SFV-7
"SFP-1A/1B SUCTION CROSSTIE"

____ SFV-11
"SFP-1B SUCTION ISOLATION"

____ SFV-46
"SFHE-1A/1B TO BWST
ISOLATION"

____ SFV-37
"SFHE-1B INLET ISOLATION"

____ SFV-49
"SFHE-1B OUTLET ISOLATION"

BWST REFILL FROM SF POOL

ACTIONSDETAILS**NOTE**

If SFV-28 has been previously positioned per Detail 6 of this Enclosure, Detail 4 may be omitted.

11.4 ____ Start BWST refill.

[Rule 5, Diesel Load Control]

1 ____ Record SF Pool initial level

SF Pool Level: _____

2 ____ Record BWST initial level

BWST Level: _____

3 ____ Ensure SFV-46 open

4 ____ Throttle SFV-28
"SFP-1B DISCHARGE
ISOLATION"
3 turns open

5 ____ Start SFP-1B

6 ____ Throttle SFV-28 as required, to
maintain SFP-1B differential
pressure between 45 and 50 psig.
(SF-4-PI2 minus SF-16-PI2)
[NOCS 040415]

BWST REFILL FROM SF POOL

ACTIONSDETAILS**NOTE**

Stopping BWST refill at 156' (-2.5') keeps SF Pool level indication on scale while accomplishing the necessary actions. Zero on SF-1-LI or SF-1-LI2 is equivalent to 158' 6" elevation.

11.5 ____ WHEN SF Pool level 156',
THEN Stop BWST refill.

1 ____ Stop SFP-1B

2 ____ Close SFV-46

3 ____ Record SF Pool final level

SF Pool Level: _____

4 ____ Record BWST final level

BWST Level: _____

11.6 ____ Restore SF Pool level.

- **PERFORM** Enclosure 12, SF Pool Refill, in this procedure.

11.7 ____ WHEN SF Pool level
restored per Enclosure 12,
AND additional BWST
inventory required,
THEN GO TO step 11.4 in
this enclosure.

11.8 ____ **EXIT** this enclosure.

SF POOL REFILL

ACTIONSDETAILSSTATUS

Spent Fuel Pool level restoration desired

- 12.1 ____ Determine total SF pool volume addition required to restore level to 159 feet.

- Perform the following calculations:

$$L^{\text{final}} - L^{\text{initial}} = L\Delta$$

$$L^{\text{final}} = \text{final SF pool level} = \underline{159} \text{ (feet)}$$

$$L^{\text{initial}} = \text{initial SF pool level} \underline{\hspace{1cm}} \text{ (feet)}$$

$$(L\Delta) (11100 \text{ gal. per foot}) = \underline{\hspace{1cm}} \text{ (gal.)}$$

$$\text{Total Volume Addition} = \underline{\hspace{1cm}} \text{ (gal.)}$$

- 12.2 ____ Restore SF Pool level to 159 feet per OP-406.

- **PERFORM** OP-406, Section 4.7, Filling Spent Fuel Pools (Alternate Method).

NOTE

To expedite BWST refill consider using reduced SF pool recirculation times and preliminary sample results for boron concentration verification.

- 12.3 ____ WHEN SF Pool level restored to 159 feet,
THEN verify SF pool boron concentration ≥ 2270 ppm.

SF POOL REFILL

ACTIONSDETAILSNOTE

OP-403B requires 10.25 hour SF pool recirculation time prior to obtaining final SF boron concentration. To expedite BWST refill consider using the results of the preliminary (1 hour) sample.

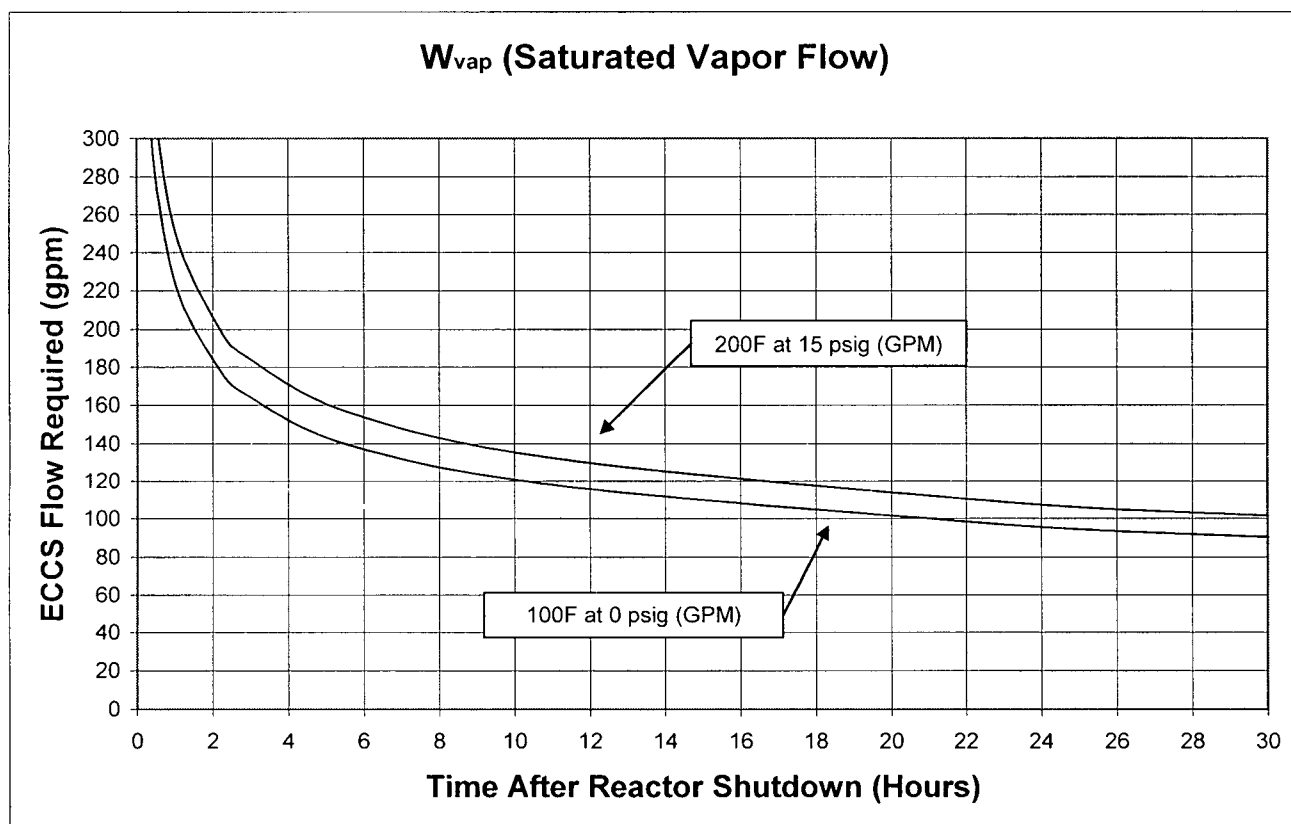
12.4 ____ IF SF Pool boron concentration < 2270 ppm, THEN increase SF pool boron per OP-403B.

- **PERFORM** OP-403B, Boric Acid Addition to the SF Pools.

12.5 ____ WHEN SF Pool boron concentration verified ≥ 2270 ppm, THEN **EXIT** this enclosure.

MINIMUM ECCS FLOWS REQUIRED TO REMOVE DH

W_{vap} (Saturated Vapor Flow) is the flow rate of water (@ 100 °F with 0 psig Reactor Building pressure; OR @ 200 °F with 15 psig Reactor Building pressure) that, when injected into the reactor vessel, will remove all the decay heat and exit as a saturated vapor. ECCS flow rates < W_{vap} may NOT keep up with vessel boil off rate and will potentially result in core damage.



- NOTES:**
1. ECCS flow rates are **NOT** adjusted for HPI instrument uncertainty.
 2. Flow Rates > two times W_{vap} bound HPI instrument uncertainty.
 3. Compare redundant HPI flow indications. If significant deviations exist consider using lowest indicated flow.

HPI FROM BWST DURING RB SUMP STRAINER BLOCKAGE

ACTIONSDETAILSSTATUS

- HPI pump in piggy back operation.
- ECCS suction path to RB sump unavailable or challenged due to RB sump strainer blockage.
- ECCS (HPI) injection from BWST required to support RB sump strainer cleaning.
- TSC has verified BWST level sufficient to support HPI at reduced flow rate.

14.1 ____ Align desired MUP suction to BWST.

- Open BWST to MUP suction:

| A Train | B Train |
|-------------|-------------|
| ____ MUV-73 | ____ MUV-58 |

- Close LPI discharge to MUP suction:

| A Train | B Train |
|-------------|-------------|
| ____ DHV-11 | ____ DHV-12 |

14.2 ____ Adjust HPI flow rate per TSC guidance.

- Split flow between all available HPI nozzles.
- Do NOT reduce HPI flow < 200 gpm.

HPI FROM BWST DURING RB SUMP STRAINER BLOCKAGE

ACTIONSDETAILS**CAUTION****BWST level must be maintained ≥ 3.5 ft while injecting from BWST.**

14.3 ____ IF at any time, BWST level is
 ≤ 4.5 ft,
THEN contact TSC.

14.4 ____ IF at any time, MUP
cavitation or vortexing exists,
THEN immediately shutdown
MUP and notify TSC.

14.5 ____ Exit this enclosure when
notified by the TSC.

RB SUMP BACKWASHING USING BWST

ACTIONS

DETAILS

STATUS

RB Sump Backwashing required using BWST.

15.1 ____ Ensure the appropriate system conditions exist to backwash the RB Sump using the BWST.

- ____ Ensure MUP suction has been transferred to the BWST per Enclosure 14
- ____ BWST level is > 7 ft.
- ____ Ensure MUP suction is NOT aligned to the train being used for backwash.
- Ensure both DHPs are stopped:
 - ____ DHP-1A
 - ____ DHP-1B
- Ensure both BSPs are stopped:
 - ____ BSP-1A
 - ____ BSP-1B

RB SUMP BACKWASHING USING BWST

ACTIONSDETAILS

15.2 ____ IF backwashing is through
DHV-42 (A Train),
THEN align the system for
backwashing through
DHV-42

1 Ensure the following valves are closed:

____ DHV-210

____ DHV-91

____ DHV-39

____ DHV-34

2 ____ Select BSV-3 to "MAN" closed.

3 ____ Ensure DHV-42 is open.

15.3 ____ IF backwashing is through
DHV-43 (B Train),
THEN align the system for
backwashing through
DHV-43

1 Ensure the following valves are closed:

____ DHV-211

____ DHV-40

____ DHV-35

2 ____ Select BSV-4 to "MAN" closed.

3 ____ Ensure DHV-43 is open.

RB SUMP BACKWASHING USING BWST

ACTIONS

DETAILS

CAUTION

- BWST level must be maintained ≥ 3.5 ft during HPI injection from BWST.
- BWST outlet valve (DHV-34 or DHV-35) must be cycled quickly to preserve BWST level for MUP suction.

15.4 ____ Cycle the BWST outlet valve on the line being backwashed.

- ____ IF backwashing is through DHV-42,
THEN cycle DHV-34 open and closed.
- ____ IF backwashing is through DHV-43,
THEN cycle DHV-35 open and closed.

RB SUMP BACKWASHING USING BWST

ACTIONSDETAILS**NOTE**

Waiting 30 minutes allows the RB sump debris to settle.

- 15.5 ____ WHEN 30 minutes has elapsed from the time backwashing was performed, OR as directed by the TSC, THEN restore LPI cooling and BS.
- ____ Perform Enclosure 19 in this procedure.
-

- 15.6 ____ Exit this enclosure when notified by the TSC.

RB SUMP BACKWASHING USING DH DROP LINE

ACTIONSDETAILSSTATUS

RB Sump Backwashing required using DH drop line.

- 16.1 ____ Ensure the appropriate system conditions exist to backwash the RB Sump using the DH Drop line.
- ____ Ensure MUP suction has been transferred to the BWST per Enclosure 14
 - Ensure both DHPs are stopped:
 - ____ DHP-1A
 - ____ DHP-1B
 - Ensure both BSPs are stopped:
 - ____ BSP-1A
 - ____ BSP-1B
 - ____ Average Tincore < 286°F by any of the following:
 - ____ SPDS
 - ____ Tincore recorders

RB SUMP BACKWASHING USING DH DROP LINE

ACTIONSDETAILS

16.2 ____ IF backwashing is through
DHV-43 (B Train),
THEN GO TO Step 16.10 in
this procedure.

16.3 ____ Align the system for
backwashing through
DHV-42 (A Train).

1 Open DC knife switches for A Train
pumps on A ES 4160V BUS:

____ Bkr 3A8 "BSP-1A BUILDING
SPRAY PUMP A"

____ Bkr 3A4 "DHP-1A DECAY HEAT
PUMP A"

2 ____ Select BSV-3 to "MAN" and closed.

3 ____ WHEN DC knife switches are open,
THEN ensure the following valves
are closed:

____ DHV-34

____ DHV-42

____ DHV-210

____ DHV-8

____ DHV-5

____ DHV-11

RB SUMP BACKWASHING USING DH DROP LINE

ACTIONS

DETAILS

NOTE

Insulated 5/16" nut driver is available in EOB-3 and EOB-11 to open sliding links.

16.4 ____ Defeat DHV-42 seal-in circuits.

- Open the following sliding links for DHV-42 seal-in circuits (inside MCB behind ES A panel bottom section):

____ TB16-8 (open seal-in)

____ TB16-6 (close seal-in)

RB SUMP BACKWASHING USING DH DROP LINE

ACTIONSDETAILS

16.5 ____ WHEN DHV-42 seal-in circuits are defeated, THEN establish drop line flow to RB sump.

1 ____ Open DHV-4

2 ____ Open DHV-41

3 ____ Select DHV-42 to "OPEN" position for 10 seconds and release.

4 ____ WHEN at least 2 min have elapsed, THEN verify DHV-42 red open light is not lit.

5 ____ IF DHV-42 red open light is lit, THEN notify TSC for further guidance.

6 ____ Open DHV-3

7 ____ Cycle DHV-39 open and closed.

8 ____ Close DHV-3

9 ____ Close DHV-4

10 ____ Close DHV-41

RB SUMP BACKWASHING USING DH DROP LINE

ACTIONSDETAILS

16.6 ____ Enable DHV-42 seal-in circuits.

- Close the following sliding links for DHV-42 seal-in circuits (inside MCB behind ES A panel bottom section):

____ TB16-8 (open seal-in)

____ TB16-6 (close seal-in)

16.7 ____ WHEN DHV-42 seal-in circuit is enabled
THEN open DHV-42

16.8 ____ Close the DC knife switches for A Train pumps on A ES 4160V BUS.

- ____ Bkr 3A8 "BSP-1A BUILDING SPRAY PUMP A"
- ____ Bkr 3A4 "DHP-1A DECAY HEAT PUMP A"

16.9 ____ **GO TO** Step 16.16

RB SUMP BACKWASHING USING DH DROP LINE

ACTIONSDETAILSSTATUS

RB Sump Backwashing using B Train Equipment.

16.10 ____ Align the system for
backwashing through
DHV-43

1 Open DC knife switches for B Train
pumps on B ES 4160V BUS:

____ Bkr 3B7 "BSP-1B BUILDING
SPRAY PUMP B"

____ Bkr 3B11 "DHP-1B DECAY HEAT
PUMP B"

2 ____ Select BSV-4 to "MAN" and closed.

3 ____ WHEN DC knife switches are open,
THEN ensure the following valves
are closed:

____ DHV-35

____ DHV-43

____ DHV-211

____ DHV-7

____ DHV-6

____ DHV-12

RB SUMP BACKWASHING USING DH DROP LINE

ACTIONS

DETAILS

NOTE

Insulated 5/16" nut driver is available in EOB-3 and EOB-11 to open sliding links.

16.11 ____ Defeat DHV-43 seal-in circuits.

- Open the following sliding links for DHV-43 seal-in circuits (inside MCB behind ES B panel bottom section):

____ TB6-18 (open seal-in)

____ TB6-16 (close seal-in)

RB SUMP BACKWASHING USING DH DROP LINE

ACTIONSDETAILS

16.12___ WHEN DHV-43 seal-in circuits are defeated, THEN establish drop line flow to RB sump.

1 ___ Open DHV-4

2 ___ Open DHV-41

3 ___ Select DHV-43 to "OPEN" position for 10 seconds and release.

4 ___ WHEN at least 2 min have elapsed, THEN verify DHV-43 red open light is not lit.

5 ___ IF DHV-43 red open light is lit, THEN notify TSC for further guidance.

6 ___ Open DHV-3

7 ___ Cycle DHV-40 open and closed.

8 ___ Close DHV-3

9 ___ Close DHV-4

10___ Close DHV-41

RB SUMP BACKWASHING USING DH DROP LINE

ACTIONS

DETAILS

16.13 ____ Enable DHV-43 seal-in circuits.

- Close the following sliding links for DHV-43 seal-in circuits (inside MCB behind ES B panel bottom section):

____ TB6-18 (open seal-in)

____ TB6-16 (close seal-in)

16.14 ____ WHEN DHV-43 seal-in circuit is enabled,
THEN open DHV-43

16.15 ____ Close the DC knife switches for B Train pumps on B ES 4160V BUS.

- ____ Bkr 3B7 "BSP-1B BUILDING SPRAY PUMP B"
- ____ Bkr 3B11 "DHP-1B DECAY HEAT PUMP B"

RB SUMP BACKWASHING USING DH DROP LINE

ACTIONS

DETAILS

NOTE

Waiting 30 minutes allows the RB sump debris to settle.

- 16.16 ____ WHEN 30 minutes has elapsed from the time backwashing was performed, OR as directed by the TSC, THEN restore LPI cooling and BS.
- ____ Perform Enclosure 19 in this procedure.

-
- 16.17 ____ Exit this enclosure when notified by the TSC.

RB SUMP BACKWASHING USING GRAVITY FLOW FROM SPENT FUEL POOLACTIONSDETAILS**STATUS**

RB Sump Backwashing required using gravity flow from the spent fuel pool.

NOTE

Establishing SF Pool level >156' 0" (-2.5') keeps SF Pool level indication on scale while accomplishing the necessary actions. Zero on SF-1-LI1 or SF-1-LI2 is equivalent to 158' 6" elevation.

17.1 ____ Ensure the appropriate system conditions exist to backwash the RB Sump using Spent Fuel Pool.

- ____ Ensure MUP suction has been transferred to the BWST per Enclosure 14
- Ensure both DHPs are stopped:
 - ____ DHP-1A
 - ____ DHP-1B
- Ensure both SFPs are stopped:
 - ____ SFP-1A
 - ____ SFP-1B
- Ensure both BSPs are stopped:
 - ____ BSP-1A
 - ____ BSP-1B
- ____ Ensure Spent Fuel Pool level > 156' 0" (-2.5' on SF-1-LI1 or SF-1-LI2).
- ____ Notify TSC to trend SFP temperature.

RB SUMP BACKWASHING USING GRAVITY FLOW FROM SF POOLACTIONSDETAILS**NOTE**

- Operating SFVs requires coordination with the OSC for AB entry.
- AB entry should be made via Hot Machine Shop (119').
- Flow to RB sump will terminate when SFP level goes below the SF Pump suction line at 154' 6" elevation.

17.2 ____ IF backwashing is through
DHV-42 (A Train),
THEN establish RB sump
backwash through DHV-42

1 Ensure the following valves are closed:

____ DHV-210

____ DHV-39

2 ____ Open SFV-89 (119 ft AB Spent Fuel
Pump Room in overhead by
mezzanine)

3 ____ Ensure DHV-42 is open.

4 ____ Cycle DHV-39 open and closed.

5 ____ Re-cycle DHV-39 open and close at
the discretion of the TSC based on
available SF Pool level.

6 ____ Close SFV-89

7 ____ **GO TO** Step 17.4

RB SUMP BACKWASHING USING GRAVITY FLOW FROM SF POOLACTIONSDETAILS

17.3 ____ IF backwashing is through
DHV-43 (B Train),
THEN establish RB sump
backwash through DHV-43

1 Ensure the following valves are closed:

____ DHV-211

____ DHV-40

2 ____ Open SFV-89 (119 ft AB Spent Fuel
Pump Room in overhead by
mezzanine).

3 ____ Ensure DHV-43 is open.

4 ____ Cycle DHV-40 open and closed.

5 ____ Re-cycle DHV-40 open and close at
the discretion of the TSC based on
available SF Pool level.

6 ____ Close SFV-89

NOTE

Waiting 30 minutes allows the RB sump debris to settle.

17.4 ____ WHEN 30 minutes has
elapsed from the time
backwashing was performed,
OR as directed by the TSC,
THEN restore LPI back in
service.

- ____ Perform Enclosure 19 in this
procedure.

RB SUMP BACKWASHING USING GRAVITY FLOW FROM SF POOLACTIONSDETAILS

17.5 ____ IF backwashing using SF pool gravity flow is no longer necessary, THEN restore SFP cooling as directed per the TSC.

- ____ Ensure Spent Fuel Pool cooling and level are restored per OP-406, Spent Fuel Pool Cooling System.

17.6 ____ Exit this enclosure when notified by the TSC.

RB SUMP BACKWASHING USING SPENT FUEL PUMP

ACTIONS

DETAILS

STATUS

RB Sump Backwashing required using spent fuel pumps.

NOTE

Establishing SF Pool level >156' 6" (-2.5') keeps SF Pool level indication on scale while accomplishing the necessary actions. Zero on SF-1-LI or SF-1-LI2 is equivalent to 158' 6"

- 18.1 ____ Ensure the appropriate system conditions exist to backwash the RB Sump using Spent Fuel pumps.
- ____ Ensure MUP suction has been transferred to the BWST per Enclosure 14
 - Ensure both DHPs are stopped:
 - ____ DHP-1A
 - ____ DHP-1B
 - Ensure both BSPs are stopped:
 - ____ BSP-1A
 - ____ BSP-1B
 - ____ Ensure SFP level > 156' 6" (-2' on SF-1-LI1 or SF-1-LI2).
 - ____ Ensure Spent Fuel Pool cooling is aligned per OP-406, Spent Fuel Pool Cooling System.
 - ____ Notify TSC to trend SFP temperature.

RB SUMP BACKWASHING USING SPENT FUEL PUMP

ACTIONS

DETAILS

NOTE

Operating SFVs requires coordination with the OSC for AB entry.

18.2 ____ Establish required SF
system alignment.

1 Ensure SFPs are NOT running:

____ SFP-1A

____ SFP-1B

2 Ensure the following DH valves are
closed:

____ DHV-40

____ DHV-39

3 Ensure the following SF valves are
closed (valves located in AB):

____ SFV-55

____ SFV-43

____ SFV-1

____ SFV-4

____ SFV-89

4 Ensure the following SF valves are open
(valves located in AB):

____ SFV-53

____ SFV-54

____ SFV-85

RB SUMP BACKWASHING USING SPENT FUEL PUMP

ACTIONS

DETAILS

CAUTION

Damage to SFP may occur if SF Pool level is < 155' 6" (-3' on SF-1-LI1 or SF-1-LI2).

18.3 ____ IF backwashing is through
DHV-42 (A Train),
THEN establish RB sump
backwash through DHV-42

1 ____ Ensure DHV-210 is closed.

2 ____ Ensure DHV-42 is open.

3 ____ Open DHV-39

4 ____ Start the designated SFP.

[Rule 5, Diesel Load Control]

5 ____ WHEN approximately 60 seconds
has elapsed from the start of the
SFP,
THEN stop the SFP.

6 ____ Close DHV-39

7 ____ **GO TO** Step 18.5

RB SUMP BACKWASHING USING SPENT FUEL PUMP

ACTIONS

DETAILS

18.4 ____ IF backwashing is through
DHV-43 (B Train),
THEN establish RB sump
backwash through DHV-43

1 ____ Ensure DHV-211 is closed.

2 ____ Ensure DHV-43 is open.

3 ____ Open DHV-40

4 ____ Start the designated SFP

[Rule 5, Diesel Load Control]

5 ____ WHEN approximately 60 seconds
has elapsed from the start of the
SFP,
THEN stop the SFP.

6 ____ Close DHV-40

NOTE

Waiting 30 minutes allows the RB sump debris to settle.

18.5 ____ WHEN 30 minutes has
elapsed from the time
backwashing was performed,
OR as directed by the TSC,
THEN restore LPI cooling
and BS.

- ____ Perform Enclosure 19 in this
procedure.

RB SUMP BACKWASHING USING SPENT FUEL PUMP

ACTIONS

DETAILS

18.6 ____ If backwashing using the SF Pump is no longer necessary, THEN restore SFP cooling as directed per the TSC.

- ____ Ensure Spent Fuel Pool cooling and level are restored per OP-406, Spent Fuel Pool Cooling System.

18.7 ____ Exit this enclosure when notified by the TSC.

RE-ESTABLISH LPI FLOW FROM THE RB SUMP

ACTIONS

DETAILS

STATUS

- RB Sump has been backwashed
- Both DHPs NOT running
- Both BSPs NOT running

NOTE

It is preferable to start the LPI pump on the train of the operating MUP.

19.1 ____ IF DHP-1B will be started,
THEN GO TO Step 19.9

RE-ESTABLISH LPI FLOW FROM THE RB SUMP

ACTIONS

DETAILS

19.2 ____ Align DHP-1A to re-establish flow from the RB sump.

1 Ensure the following valves are closed:

____ DHV-3

____ DHV-4

____ DHV-41

____ DHV-39

____ DHV-34

____ DHV-11

2 Ensure the following valves are open:

____ DHV-42

____ DHV-5

____ DHV-210

3 ____ Ensure DHV-110 is selected to "MAN" and closed.

19.3 ____ Start DHP-1A and required cooling water pumps.

[Rule 5, Diesel Load Control]

| |
|-------------|
| ____ DCP-1A |
| ____ RWP-3A |
| ____ DHP-1A |

RE-ESTABLISH LPI FLOW FROM THE RB SUMP

ACTIONS

DETAILS

CAUTION

Maintain a minimum HPI flow > 200 gpm.

19.4 ____ IF A ES selected MUP is running,
THEN establish piggyback operation.

1 ____ Open DHV-11

2 ____ IF at any time, indications of RB Sump blockage exist while increasing HPI flow,
THEN reduce flow until conditions do NOT exist and contact TSC.

3 Increase HPI flow at 100 gpm increments, waiting 2 minutes between increments until all HPI valves are open:

____ MUV-23

____ MUV-24

____ MUV-25

____ MUV-26

4 ____ Close MUV-73

RE-ESTABLISH LPI FLOW FROM THE RB SUMP

ACTIONSDETAILS

19.5 ____ IF A ES selected MUP
is NOT running,
THEN establish LPI flow.

1 ____ IF at any time, indications of
RB Sump blockage exist while
increasing LPI flow,
THEN reduce flow until conditions
do NOT exist and contact TSC.

2 ____ Manually throttle DHV-110
to establish 600 gpm
(500 to 600 gpm) at 100 gpm
increments every 2 minutes.

3 ____ Ensure DHV-110 setpoint is
adjusted to 600 gpm and select to
"AUTO".

19.6 ____ IF piggyback operation
is NOT established,
AND stopping HPI flow from
the BWST is desired,
THEN stop the HPI flow from
the BWST.

1 Stop any running HPI pump:

____ MUP-1A

____ MUP-1B

____ MUP-1C

2 Ensure all HPI valves are fully closed:

____ MUV-23

____ MUV-24

____ MUV-25

____ MUV-26

3 Ensure MUP BWST suction valves are
closed:

____ MUV-58

____ MUV-73

RE-ESTABLISH LPI FLOW FROM THE RB SUMP

ACTIONS

DETAILS

19.7 ____ Contact TSC for guidance to
restore BS.

19.8 ____ Exit this enclosure when
notified by the TSC.

RE-ESTABLISH LPI FLOW FROM THE RB SUMP

ACTIONS

DETAILS

STATUS

DHP-1B will be started.

19.9___ Align DHP-1B to re-establish
flow from the RB sump.

1 Ensure the following valves are closed:

___ DHV-3

___ DHV-4

___ DHV-41

___ DHV-40

___ DHV-35

___ DHV-12

2 Ensure the following valves are open:

___ DHV-43

___ DHV-6

___ DHV-211

3 ___ Ensure DHV-111 is selected to
"MAN" and closed.

RE-ESTABLISH LPI FLOW FROM THE RB SUMP

ACTIONS

DETAILS

19.10 ____ Start DHP-1B and required cooling water pumps.

[Rule 5, Diesel Load Control]

| |
|-------------|
| ____ DCP-1B |
| ____ RWP-3B |
| ____ DHP-1B |

CAUTION

Maintain a minimum HPI flow > 200 gpm.

19.11 ____ IF B ES selected MUP is running,
THEN establish piggyback operation.

1 ____ Open DHV-12

2 ____ IF at any time, indications of RB Sump blockage exist while increasing HPI flow,
THEN reduce flow until conditions do NOT exist and contact TSC.

3 Increase HPI flow at 100 gpm increments, waiting 2 minutes between increments until all HPI valves are open:

____ MUV-23

____ MUV-24

____ MUV-25

____ MUV-26

4 ____ Close MUV-58

RE-ESTABLISH LPI FLOW FROM THE RB SUMP

ACTIONS

DETAILS

19.12 ____ IF B ES selected MUP
is NOT running,
THEN establish LPI flow.

1 ____ IF at any time, indications of
RB Sump blockage exist while
increasing LPI flow,
THEN reduce flow until conditions
do NOT exist and contact TSC.

2 ____ Manually throttle DHV-111
to establish 600 gpm
(500 to 600 gpm) at 100 gpm flow
increments every 2 minutes.

3 ____ Ensure DHV-111 setpoint is
adjusted to 600 gpm and select to
"AUTO".

19.13 ____ IF piggyback operation
is NOT established,
AND stopping HPI flow from
the BWST is desired,
THEN stop HPI flow from the
BWST.

1 Stop any running HPI pumps:

____ MUP-1A

____ MUP-1B

____ MUP-1C

2 Ensure all HPI valves are fully closed:

____ MUV-23

____ MUV-24

____ MUV-25

____ MUV-26

3 Ensure MUP BWST suction valves are
closed:

____ MUV-58

____ MUV-73

RE-ESTABLISH LPI FLOW FROM THE RB SUMP

ACTIONS

DETAILS

19.14___ Contact TSC for guidance to
restore BS.

19.15___ Exit this enclosure when
notified by the TSC.

SUMMARY OF CHANGES PRR 332831

- NOTES:** 1. Writers and Reviewers: Ensure that any changes to this procedure that affect information contained in ERF posters, enclosures, briefing cards, guidelines etc. are made to those items as well.
2. Writers and Reviewers: Changes to certain parts of this procedure may impact other EIPs. Ensure appropriate PRRs are initiated as needed.

| SECTION | CHANGE |
|---------------------------|--|
| Throughout | Reformatting IAW PRO-NGGC-0201. |
| 1.0.2 | Added new purpose step stating "this procedure is an emergency plan implementing procedure. any revisions to this procedure must be carefully considered for emergency plan impact." (PRR321656) |
| 2.2 | Added new implementing references section |
| 6.0.2 | added "(reference section 9.2.3)" |
| 9.2.1 bullet 3 | Changed from "Recall Point" to "RECL" |
| 9.2.1 bullet 4 | Deleted reference to OP-404 section. Removing the section number prevent inconsistency for future reformatting of OP-404 which affects the section numbers. (PRR 332831) |
| 9.2.4 | Added EOP-8A for clarification |
| 9.3 | Added reference to Section 6.9, calculation M90-0023 and Calculation M90-0021 for information on RB water level requirements. |
| 9.6 | Added reference to NOCS 100504 and deleted reference to NOCS 100484 |
| 9.6.2 bullet 2 | Changed from "Recall Point" to "RECL" |
| Enclosure 11 step 11.1 | Deleted reference to OP-406 section. Removing the section number prevent inconsistency for future reformatting of OP-406 which affects the section numbers. |
| Enclosure 12 step 12.4 | Deleted reference to OP-403B section. Removing the section number prevent inconsistency for future reformatting of OP-403B which affects the section numbers. |

| SECTION | CHANGE |
|---|---|
| <p>Enclosure 11 Note prior to step 11.5</p> <p>Enclosure 17 Note prior to step 17.1</p> <p>Enclosure 18 Note prior to step 18.1</p> | <p>Added a note prior to step 11.4 and revised note prior to step 17.1 and 18.1 to define the bases for the 156' and 156' 6" elevation for stopping BWST fill or back washing the RB sump. (Ref PRR 461294)</p> |
| <p>Summary of Changes</p> | <p>Added two new steps before summary of changes table (PRR 411916)</p> |

#1242



I
Information
Use

CRYSTAL RIVER UNIT 3
PLANT OPERATING MANUAL

EMERGENCY PLAN IMPLEMENTING PROCEDURE

EM-225F

LONG TERM EMERGENCY FEEDWATER MANAGEMENT

REVISION 7

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1.0 PURPOSE

1. The purpose of this procedure is to provide guidance to the TSC Accident Assessment Team (AAT) to ensure Emergency Feedwater (EFW) or Auxiliary Feedwater (AFW) remains available when OTSG heat transfer is required to remove core decay heat.
2. These guidelines are applicable if EFW or AFW is operating for extended periods of time and normal surveillance testing is not in progress.
3. This procedure is an emergency plan implementing procedure. Any revisions to this procedure must be carefully considered for emergency plan impact.

2.0 REFERENCES

2.1 Developmental References

1. PC 99-1710
2. M 99-0027 Rev. 8, CR-3 Emergency Feedwater System Hydraulic Design Verification Analysis
3. NRC Letter to FPC, 3N0899-05, dated 8/11/99, NRC Safety Evaluation Related to Amendment 182
4. Engineering Calculation E 91-0026 Revision 5, EGDG-1A Scenario Based Loading, Voltage Dip, Frequency Dips and Transient Motor Starting Analysis
5. PC 99-3329
6. FPC Letter to NRC, 3F1198-01, dated 11/24/98
7. EC 55315, Alternate AC Diesel Generator
8. Engineering Calculation E91-0027, Revision 5, EGDG-1B Scenario Based Loading, Voltage Dip, Frequency Dips and Transient Motor Starting Analysis

3.0 DEFINITIONS

None

4.0 RESPONSIBILITIES

1. TSC Accident Assessment Team (AAT)
 - Monitor EFT-2 temperature and provide recommendations to resolve high temperatures if approached.
 - Provide recommendations for alternate feedwater sources and feedwater flow paths during long term EFW or AFW operation.
 - Ensure EFW or AFW is maintained until OTSG heat transfer is no longer required.
2. Emergency Coordinator (EC)
 - Review and approve all recommendations provided by the Accident Assessment Team prior to implementation by the Control Room staff.
3. Emergency Repair Team (ERT)
 - Install support equipment for transferring the contents of EFT-2 to either FST-1A or CDT-1 due to elevated temperatures in EFT-2.
4. Operations (OPS)
 - Coordinate with the Control Room and provide alternate alignments for EFW or AFW systems and support systems.

5.0 PREREQUISITIES

None

6.0 PRECAUTIONS LIMITATIONS AND NOTES

1. If the affected ES 4160V Bus is being powered by a diesel, then ensure adequate Diesel load margin is available per EOP-13, Rule 5, "Diesel Load Control" prior to starting equipment.
2. EFT-2 tank temperature is only available on a local gauge (EF-28-TI) inside the tank building. Hazardous conditions may exist due to nitrogen gas leakage. If a loss of off-site power has occurred, ventilation and lighting will not be available in the enclosure.
3. EFT-2 temperature increases faster as level decreases.
4. EFW or AFW pump discharge TEMP of > 150°F can challenge NPSH limits, equipment qualifications, and RB penetration stresses. EFT-2 TEMP is limited to < 139°F to prevent exceeding these limits.
5. All actions recommended to the Control Room as a result of this procedure must be pre-approved by the Emergency Coordinator.
6. Inadequate NPSH could occur if EFP-3 is placed in STOP and allowed to run at reduced speed if EFT-2 is isolated. Stop EFP-3 by placing control switch in Pull To Lock.
7. FW-336-TI (95 IB on the RB wall across from EFP-2) can be used to monitor EFW discharge temperature only if flow to the OTSGs exists.
8. Use hand-held contact thermometers to monitor temperatures locally at EFW/AFW pumps if other instrumentation is not available and pump discharge temps are desired.
9. Following a steam generator overfill event ensure the main steam lines and the EFP-2 steam supply header are properly drained prior to starting EFP-2.
10. When operating EFP-1 or EFP-2 with the pump suction aligned solely to CDT-1 or FST-1A/1B maintain EFV-142 in the full open position to ensure adequate NPSH to the EFPs.
11. The maximum flow for FWP-7 is 600 gpm (runout flow limit). This takes into consideration the maximum possible recirculation flow rate back to CDT-1 and the possible instrument uncertainty that could be associated with the instrumentation.
12. Starting FWP-7 when Alternate AC Diesel is aligned to an ES Bus has not been analyzed. (Ref E91-0026 and E91-0027)

7.0 SPECIAL TOOLS AND EQUIPMENT

None

8.0 ACCEPTANCE CRITERIA

None

9.0 INSTRUCTIONS

9.1 General Guidelines

NOTES: 1. Closing NGV-243 early will ensure EFT-2 and CDT-1/FST-1A levels will draw down together.

2. EFT-2 Building may be locked requiring use of a master key (P Key) to obtain access.

1. If EFW is operating, then notify the TSC Repair Coordinator that an available operator and re-entry team are needed to isolate the nitrogen supply to EFT-2 by closing NGV-243 "N2 TO EFT-2" (119 ft TB by FWHE-2B).

NOTE: EFT-2 temperature is only available on a local gauge (EF-28-TI) inside the tank building.

2. If EFW or AFW is operating, then start plotting EFT-2 level, CDT-1 level and EFT-2 temperatures on Enclosure 1, EFT-2/CDT-1 Trends in this procedure.
3. Review EFW Management Plan, Enclosure 2, EFW Management Plan in this procedure, and perform appropriate actions if required.

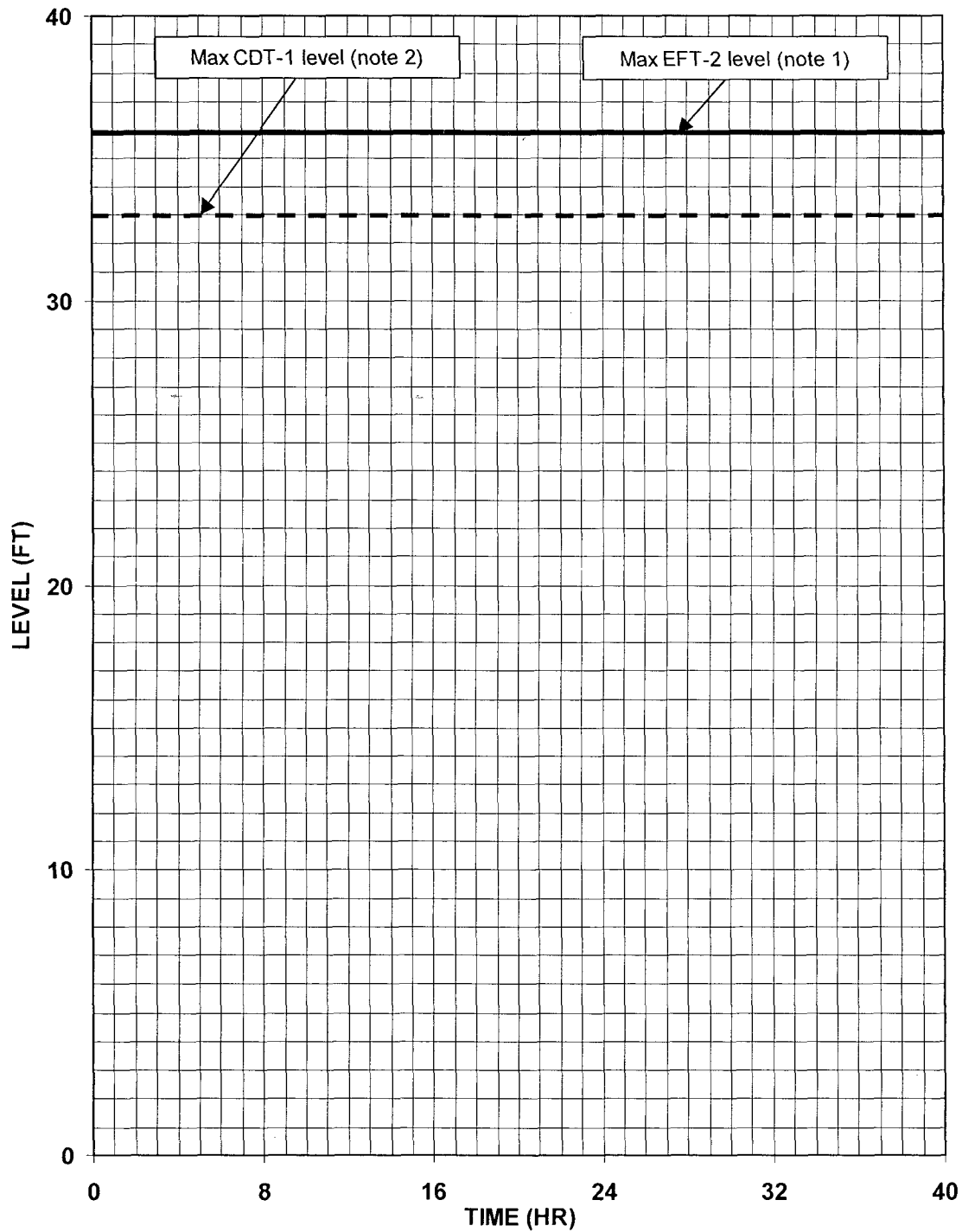
NOTE: EFT-2 temperature limit of 139°F can be challenged within 8 hours under extreme conditions.

4. If at any time, any EFW pump is running and EFT-2 level is < 20 ft, then refer to Enclosure 3, EFT-2/CDT-1 Inventory Control in this procedure for guidance.
5. If at any time, FWP-7 is running and CDT-1 level is < 20 ft, then refer to Enclosure 3, EFT-2/CDT-1 Inventory Control in this procedure for guidance.
6. If at any time, EFT-2 TEMP is $\geq 110^{\circ}\text{F}$, then notify the TSC Repair Coordinator to install EFT-2 temporary transfer hose per Enclosure 4, Installation of EFT-2 Temporary Transfer Line in this procedure.
7. If at any time, EFT-2 TEMP reaches 130°F , then refer to Enclosure 5, EFT-2 Transfer to Alternate Tanks for Cooling in this procedure for guidance.
8. If at any time, EFT-2 will be cross-tied to CDT-1, then notify Chemistry to consider Amerzine addition to CDT-1.
9. When performance of EM-225F is not required, then ensure EFT-2 building penetrations and EF/CD system configuration is restored.

10.0 RECORDS

All enclosures are quality records.

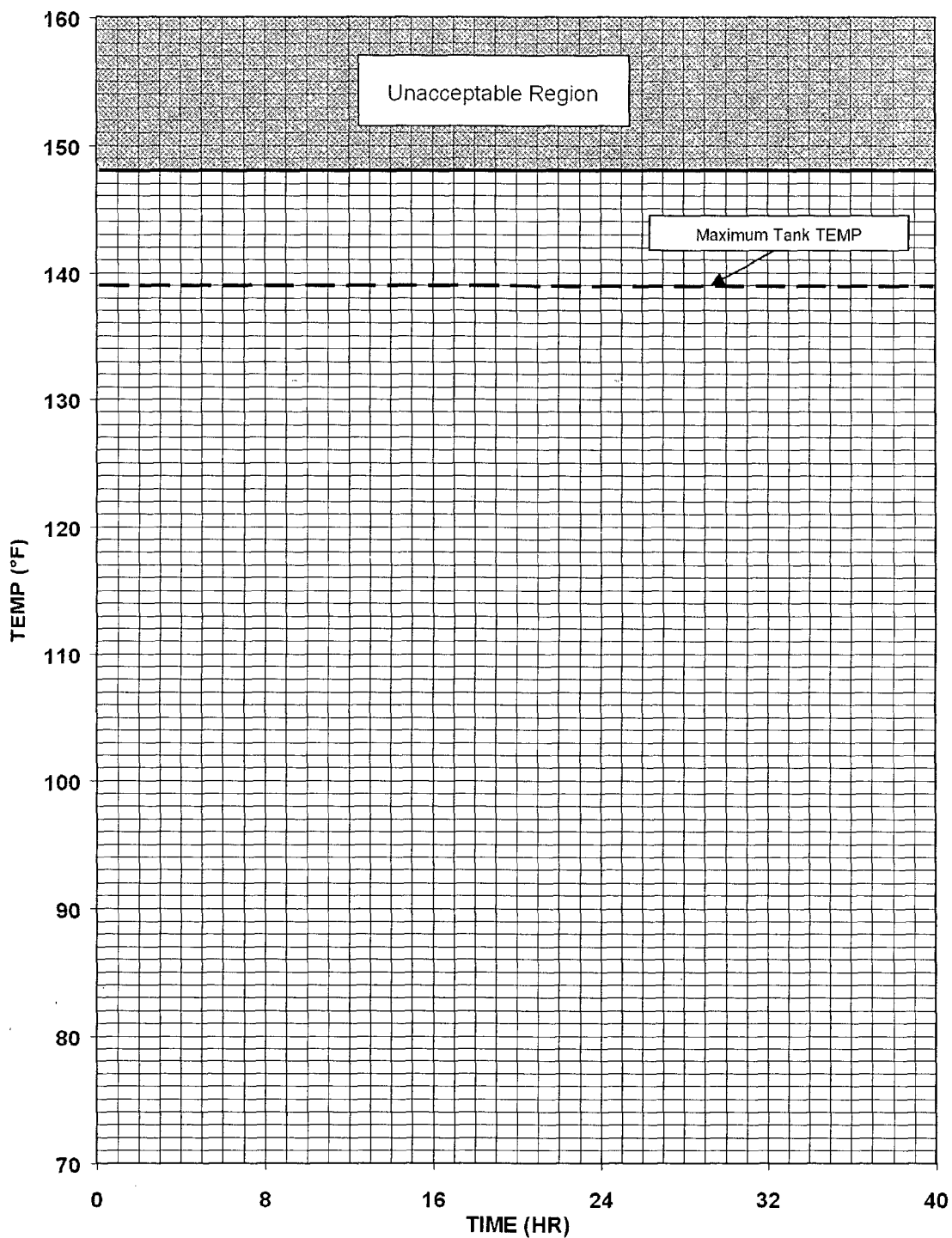
EFT-2/CDT-1 TRENDS
LEVEL TRENDS



Note 1: EFT-2 level instrumentation reference leg will flood if level is > 36 ft.

Note 2: CDT-1 will overflow to TB if level is > 33 ft.

EFT-2/CDT-1 TRENDS
TEMP TRENDS



Note 1: EFT-2 TEMP can be obtained from EF-28-TI (119 ft EFT-2 Building).

STATUS: EFP-3 IS RUNNING

| | | |
|---------|--------|--------------|
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|---------|--------|--------------|

EFW MANAGEMENT PLAN

| STATUS: EFP-2 IS RUNNING | | |
|--|---|-----------------------------|
| PROBLEM | SOLUTION | REFER TO |
| EFT-2 TEMP is $\geq 130^{\circ}\text{F}$ | <ul style="list-style-type: none"> • IF Alternate AC Diesel is NOT powering an ES 4160V Bus, THEN START FWP-7 aligned to CDT-1 • START FWP-7 aligned to CDT-1 • STOP EFP-2 | Enclosure 9 |
| | -----OR----- | -----OR----- |
| | <ul style="list-style-type: none"> • ALIGN EFP-2 to hotwell. • ALIGN Units 1 or 2 Aux steam to EFP-2 before OTSG PRESS < 200 psig. | Enclosure 12 Enclosure 6 |
| | -----OR----- | -----OR----- |
| | • ALIGN EFP-2 to CDT-1 AND ISOLATE EFT-2 | Enclosure 5 |
| | | |
| All the following exist: <ul style="list-style-type: none"> • Water sources on berm are depleted • Hotwell is not available | • FILL Fire Storage Tanks using Units 1/2 Fire Service. | Enclosure 13 |
| All the following exist: <ul style="list-style-type: none"> • EFP-2 suction is aligned to hotwell • Hotwell level is approaching 24 in | <ul style="list-style-type: none"> • IF adequate level exists in EFT-2, AND EFT-2 temperature is < 139°F, THEN ALIGN EFP-2 suction to EFT-2 | Enclosure 14 |
| | -----OR----- | -----OR----- |
| | <ul style="list-style-type: none"> • Gravity drain water from CDT-1 and FST-1A/B to hotwell using CDV-88 | N/A |
| All the following are NOT available: <ul style="list-style-type: none"> • EFP-3 • FWP-7 | <ul style="list-style-type: none"> • IF EFP-1 is NOT available, THEN ALIGN Unit 1 or 2 steam to EFP-2 | Enclosure 6 |
| | -----OR----- | -----OR----- |
| | <ul style="list-style-type: none"> • IF EFP-1 is available AND only A ES 4160V BUS energized, THEN START EFP-1 • STOP EFP-2 | Enclosure 10 |
| | -----OR----- | -----OR----- |
| | <ul style="list-style-type: none"> • IF EFP-1 is available AND Both ES 4160V Buses are energized by Diesel, THEN START EFP-1 • STOP EFP-2 | Enclosure 9 |
| | | Enclosure 11 |
| | | Enclosure 9 |

EFW MANAGEMENT PLAN

| STATUS: EFP-1 IS RUNNING | | |
|--|--|--------------|
| PROBLEM | SOLUTION | REFER TO |
| EFT-2 TEMP is $\geq 130^{\circ}\text{F}$ | <ul style="list-style-type: none"> • IF Alternate AC Diesel is NOT powering an ES 4160V Bus, THEN START FWP-7 aligned to CDT-1 • STOP EFP-1 | Enclosure 9 |
| | -----OR----- | -----OR----- |
| | <ul style="list-style-type: none"> • ALIGN suction of EFP-1 to hotwell. | Enclosure 12 |
| | -----OR----- | -----OR----- |
| | <ul style="list-style-type: none"> • ALIGN EFP-1 to CDT-1 AND ISOLATE EFT-2 | Enclosure 5 |
| All the following exist: <ul style="list-style-type: none"> • Water sources on berm are depleted • Hotwell is NOT available | <ul style="list-style-type: none"> • FILL Fire Storage Tanks using Units 1/2 Fire Service. | Enclosure 13 |
| All the following exist: <ul style="list-style-type: none"> • EFP-1 suction is aligned to hotwell • Hotwell level is approaching 24 in | <ul style="list-style-type: none"> • IF adequate level exists in EFT-2, AND EFT-2 temperature is $< 139^{\circ}\text{F}$, THEN ALIGN EFP-1 suction to EFT-2 | Enclosure 14 |
| | -----OR----- | -----OR----- |
| | <ul style="list-style-type: none"> • IF adequate level exists in EFT-2, AND EFT-2 temperature is $< 139^{\circ}\text{F}$, THEN START EFP-3 aligned to EFT-2 | Enclosure 9 |
| | -----OR----- | -----OR----- |
| | <ul style="list-style-type: none"> • Gravity drain water from CDT-1 and FST-1A/B to hotwell using CDV-88 | N/A |
| Any of the following are failed: <ul style="list-style-type: none"> • A Train battery chargers • A Train battery failure | <ul style="list-style-type: none"> • START EFP-2 • IF Alternate AC Diesel is NOT aligned to a ES 4160V Bus AND FWP-7 is available, THEN start FWP-7 • STOP EFP-1 before A Train battery fails. | Enclosure 9 |
| | -----OR----- | -----OR----- |
| | IF EFP-2 or FWP-7 NOT available, THEN CROSS-TIE EFP-1 to B Train EFW | Enclosure 16 |

EFW MANAGEMENT PLAN

| STATUS: FWP-7 IS RUNNING | | |
|---|--|---|
| PROBLEM | SOLUTION | REFER TO |
| CDT-1 TEMP is $\geq 130^{\circ}\text{F}$ | <ul style="list-style-type: none"> • IF adequate level exists in EFT-2, AND EFT-2 temperature is $< 139^{\circ}\text{F}$, THEN START EFP-2 aligned to EFT-2 • STOP FWP-7 • ALIGN Unit 1 or 2 steam to EFP-2 | Enclosure 9 |
| | -----OR----- | -----OR----- |
| | <ul style="list-style-type: none"> • ALIGN suction of FWP-7 to hotwell. • Gravity drain CDT-1 to hotwell using CDV-88 | Enclosure 9 Enclosure 6 |
| | -----OR----- | -----OR----- |
| | <ul style="list-style-type: none"> • IF Off-site power is available, THEN REFILL CDT-1 with Demin Water. | Enclosure 12 -----OR----- Enclosure 3 |
| All the following exist: <ul style="list-style-type: none"> • FWP-7 suction is aligned to hotwell • Hotwell level approaching 24 in | <ul style="list-style-type: none"> • Gravity drain water from CDT-1 and FST-1A/B to hotwell using CDV-88 | N/A |
| All the following exist: <ul style="list-style-type: none"> • EFP-1 start up is desired • EDG load management NOT possible | <ul style="list-style-type: none"> • IF EFP-1 is available AND only A ES 4160V BUS energized, THEN START EFP-1 • STOP FWP-7 | Enclosure 10 Enclosure 9 |
| | -----OR----- | -----OR----- |
| | <ul style="list-style-type: none"> • IF EFP-1 is available, AND Both ES 4160V Buses are energized by Diesel, THEN START EFP-1 • STOP FWP-7 | Enclosure 11 Enclosure 9 |

EFT-2/CDT-1 INVENTORY CONTROL

ACTIONS

DETAILS

3.1 ____ IF at least 1 CDP is running,
THEN maintain EFT-2 level.

1 ____ Ensure CD Hdr PRESS is between
90 and 150 psig.

2 Notify SPO to maintain EFT-2 level
between 10 and 36 ft
(95 ft TB behind Atmospheric
Drain Tank):

____ Open CDV-260
"EFT-2 FILL FROM CONDENSATE".

____ Throttle CDV-259
"EFT-2 FILL FROM CONDENSATE"
as necessary to maintain EFT-2 level.

EFT-2/CDT-1 INVENTORY CONTROL

ACTIONSDETAILS

3.2 ____ Maintain CDT-1 level.

- ____ IF at least 1 CDP is running,
THEN maintain CDT-1 level
between 10 and 31 ft using CD:
 - ____ Ensure CD Hdr PRESS is
between 90 and 150 psig.
 - ____ Notify SPO to throttle CDV-88
"CONDENSATE REJECT
TO CDT-1"
as necessary to maintain
CDT-1 level
(95 ft TB behind Atmospheric
Drain Tank).
- ____ IF no CDPs are running,
THEN notify SPO to maintain
CDT-1 level between 10 and 31 ft
using DW:
 - ____ Ensure CDV-88
"CONDENSATE REJECT TO
CDT-1" is closed
(95 ft TB behind Atmospheric
Drain Tank).
 - ____ Throttle CDV-112
"DW MAKEUP TO CDT-1"
as necessary to maintain
CDT-1 level
(95 ft TB by MFWBPs).

INSTALLATION OF EFT-2 TEMPORARY TRANSFER LINE

ACTIONSDETAILSCAUTION

Entry into EFT-2 Building may require additional precautions if power is not available to ventilation fan.

NOTE

- All fittings, hoses, and tools are located in the Fire Pump House.
- Five individuals are required to perform this enclosure

4.1 _____ Notify Control Room that EFT-2 temporary transfer line is being installed.

4.2 _____ IF B 4160V UNIT BUS is energized,
THEN ensure AHF-152 "EFT-2 ENC Vent Fan" runs for > 10 min prior to entry (Entrance to EFT-2).

4.3 _____ Ensure EFV-96 "EFT-2 DRAIN" is closed (Inside EFT-2 Building north wall). (OPS or ERT)

- Refer to Enclosure 17, "EFP-2 TEMPORARY TRANSFER LINE CONFIGURATION," Figures 1 and 2, in this procedure.

4.4 _____ Remove 4 in blank flange from EFV-96 "EFT-2 DRAIN" (Inside EFT-2 Building north wall). (ERT)

- Refer to Enclosure 17, "EFP-2 TEMPORARY TRANSFER LINE CONFIGURATION," Figures 1 and 2, in this procedure.

INSTALLATION OF EFT-2 TEMPORARY TRANSFER LINE

ACTIONSDETAILSNOTE

Match marks are installed on the flexible spool piece for match-up with EFV-96.

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|--|---|
| 4.5 ____ Install flexible spool piece with gaskets between EFV-96 "EFT-2 DRAIN" and spare penetration (Inside EFT-2 Building north wall). (ERT) | • Refer to Enclosure 17, "EFP-2 TEMPORARY TRANSFER LINE CONFIGURATION," Figures 1 and 2, in this procedure |
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|--|---|
| 4.6 ____ Ensure flange bolts and hose clamps are tight. (ERT) | • Refer to Enclosure 17, "EFP-2 TEMPORARY TRANSFER LINE CONFIGURATION," Figures 1 and 2, in this procedure |
|--|---|
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- | | |
|--|---|
| 4.7 ____ Remove 4 in blank flange on spare penetration (Maintenance Support Building under diamond plate, below stairs south wall). (ERT) | • Refer to Enclosure 17, "EFP-2 TEMPORARY TRANSFER LINE CONFIGURATION," Figures 1 and 2, in this procedure |
|--|---|
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- | | |
|--|---|
| 4.8 ____ Install double elbow assembly with gaskets on spare penetration. (ERT) | • Refer to Enclosure 17, "EFP-2 TEMPORARY TRANSFER LINE CONFIGURATION," Figures 1 and 2, in this procedure |
|--|---|
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INSTALLATION OF EFT-2 TEMPORARY TRANSFER LINE

ACTIONSDETAILS

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- | | | |
|-------------|---|--|
| 4.9 ____ | Install hose adapter with gaskets to double elbow assembly. | • Refer to Enclosure 17, "EFP-2 TEMPORARY TRANSFER LINE CONFIGURATION," Figures 1 and 2, in this procedure |
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|--------------|--------------------------------------|--|
| 4.10 ____ | Ensure flange bolts are tight. (ERT) | • Refer to Enclosure 17, "EFP-2 TEMPORARY TRANSFER LINE CONFIGURATION," Figures 1 and 2, in this procedure |
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| 4.11 ____ | Ensure adequate temporary support is placed under hose adapter. | |
|--------------|---|--|
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- | | | |
|--------------|--|--|
| 4.12 ____ | Connect 6 in hose to hose adapter on double elbow assembly and tighten securely. (ERT) | |
|--------------|--|--|
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- | | | |
|--------------|--|--|
| 4.13 ____ | IF EFT-2 connection to FST-1A is desired, <u>THEN GO TO</u> Step 4.22 in this enclosure. | |
|--------------|--|--|
-

INSTALLATION OF EFT-2 TEMPORARY TRANSFER LINE

ACTIONSDETAILSSTATUS

EFT-2 connection to CDT-1 is desired.

CAUTION

FWP-7 cannot be operated if EFT-2 is connected to CDT-1 unless FWV-265 is closed.

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- 4.14 ____ Install 4x6 in adapter with gaskets on FWV-265 "FWP-7 FW EMERGENCY TRANSFER TO FS OR SD SYSTEM ISO" (119 ft TB near southwest stairway). (ERT)
- Refer to Enclosure 17, "EFP-2 TEMPORARY TRANSFER LINE CONFIGURATION," Figure 3, in this procedure.
-
- 4.15 ____ Install hose adapter with gaskets to 4 x 6 in adapter.
- Refer to Enclosure 17, "EFP-2 TEMPORARY TRANSFER LINE CONFIGURATION," Figure 3, in this procedure.
-
- 4.16 ____ Ensure adequate temporary support is placed under hose adapter.

INSTALLATION OF EFT-2 TEMPORARY TRANSFER LINE

ACTIONSDETAILSNOTE

Route Hose Between Fsts, Down East Side Of Fst-1a And Through Turbine Building Door.

- 4.17 ____ Connect sections of 6 in hose together and attach to hose adapter on FWV-265 "FWP-7 FW EMERGENCY TRANSFER TO FS OR SD SYSTEM ISO" (119 ft TB near southwest stairway).(ERT)

- Refer to Enclosure 17, "EFP-2 TEMPORARY TRANSFER LINE CONFIGURATION," Figure 3, in this procedure.

INSTALLATION OF EFT-2 TEMPORARY TRANSFER LINE

ACTIONSDETAILS

4.18 ____ Ensure all couplings and fittings are tight. (ERT)

4.19 ____ Pressurize transfer hose. (OPS)

1 ____ Slowly open EFV-96
"EFT-2 DRAIN"
(Inside EFT-2 Building north wall).

2 ____ Check all hoses and connections for leaks.

3 ____ IF leaks exist,
THEN perform the following in order:

____ Close EFV-96
"EFT-2 DRAIN"
(Inside EFT-2 Building
north wall).

____ Repair leaks.

4.20 ____ Close EFV-96
"EFT-2 DRAIN"
(Inside EFT-2 Building
north wall).

4.21 ____ **EXIT** this enclosure.

INSTALLATION OF EFT-2 TEMPORARY TRANSFER LINE

ACTIONSDETAILSSTATUS

EFT-2 connection to FST-1A is desired.

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- | | | |
|-----------|--|--|
| 4.22 ____ | Install 2½ x 4 in adapter and 4 x 6 in adapter with gaskets to FSV-919 "FST-1A DRAIN AND SAMPLE VALVE" (Southeast side of FST-1A). | • Refer to Enclosure 17, "EFP-2 TEMPORARY TRANSFER LINE CONFIGURATION," Figure 4, in this procedure. |
|-----------|--|--|
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- | | | |
|-----------|--|--|
| 4.23 ____ | Install hose adapter with gaskets to 4 x 6 in adapter. | • Refer to Enclosure 17, "EFP-2 TEMPORARY TRANSFER LINE CONFIGURATION," Figure 4, in this procedure. |
|-----------|--|--|
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|-----------|---|--|
| 4.24 ____ | Ensure adequate temporary support is placed under hose adapter. | |
|-----------|---|--|
-
- | | | |
|-----------|--|--|
| 4.25 ____ | Connect sections of 6 in hose together and attach to hose adapter on FSV-919 "FST-1A DRAIN AND SAMPLE VALVE" (Southeast side of FST-1A). | • Refer to Enclosure 17, "EFP-2 TEMPORARY TRANSFER LINE CONFIGURATION," Figure 4, in this procedure. |
|-----------|--|--|
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- | | | |
|-----------|--|--|
| 4.26 ____ | Ensure all couplings and fittings are tight. | |
|-----------|--|--|
-

INSTALLATION OF EFT-2 TEMPORARY TRANSFER LINE

ACTIONS

DETAILS

4.27 ____ Pressurize transfer hose.
(OPS)

1 ____ Slowly open EFV-96
"EFT-2 DRAIN"
(Inside EFT-2 Building north wall).

2 ____ Check all hoses and connections for
leaks.

3 ____ IF leaks exist,
THEN perform the following in order:

____ Close EFV-96
"EFT-2 DRAIN"
(Inside EFT-2 Building
north wall).

____ Repair leaks.

4.28 ____ Close EFV-96
"EFT-2 DRAIN"
(Inside EFT-2 Building
north wall).

4.29 ____ **EXIT** this enclosure.

EFT-2 TRANSFER TO ALTERNATE TANKS FOR COOLING

ACTIONS

DETAILS

- 5.1 IF EFT-2 transfer
to FST-1A is desired,
THEN GO TO Step 5.12
in this enclosure.

EFT-2 TRANSFER TO ALTERNATE TANKS FOR COOLING

ACTIONS

DETAILS

5.2 ___ Verify 6 in hose is installed
 between EFT-2 and
 FWV-265
 "FWP-7 FW EMERGENCY
 TRANSFER TO FS OR SD
 SYSTEM ISO"
 (119 ft TB near southwest
 stairway).

 ___ IF hose is NOT installed
 between EFT-2 and
 FWV-265,
 THEN PERFORM
 Enclosure 4 in this
 procedure.

EFT-2 TRANSFER TO ALTERNATE TANKS FOR COOLING

ACTIONSDETAILS**CAUTION**

Entry into EFT-2 Building may require additional precautions if power is not available to ventilation fan.

- 5.3 ____ IF B 4160V UNIT BUS is energized,
THEN ensure AHF-152 "EFT-2 ENC Vent Fan" runs for > 10 min prior to entry (Entrance to EFT-2).
-

- 5.4 ____ Open EFV-96 "EFT-2 DRAIN" (Inside EFT-2 Building north wall).
-

- 5.5 ____ Ensure transfer hose is not leaking.
-

NOTE

The next steps may result in a rapid decrease in EFT-2 level.

- 5.6 ____ Notify Control Room EFT-2 alignment to CDT-1 is in progress.

EFT-2 TRANSFER TO ALTERNATE TANKS FOR COOLING

ACTIONSDETAILS

5.7 ___ Open FWV-265
 "FWP-7 FW EMERGENCY
 TRANSFER TO FS OR SD
 SYSTEM ISO"
 (119 ft TB near south
 west stairway).

5.8 ___ Ensure CDV-103
 "CDT-1 TO EFP SUCTION"
 is open
 (119 ft Berm by CDT-1).

5.9 ___ Unlock and close EFV-111
 "EFT-2 TO EFP SUCTION
 ISOLATION "
 (Inside EFT-2 Building
 northwest corner).

5.10 ___ Unlock and close EFV-109
 "EFT-2 TO EFP SUCTION
 ISOLATION"
 (Inside EFT-2 Building
 north wall).

5.11 ___ **EXIT** this enclosure.

EFT-2 TRANSFER TO ALTERNATE TANKS FOR COOLING

ACTIONS

DETAILS

STATUS

EFT-2 transfer to FST-1A is desired.

- 5.12 ____ Verify 6 in hose is installed
between EFT-2 and FSV-919
"FST-1A DRAIN AND
SAMPLE VALVE"
(Southeast side of FST-1A).

- ____ IF hose is NOT installed
between EFT-2 and
FSV-919,
THEN PERFORM
Enclosure 4 in this
procedure.

CAUTION

Entry into EFT-2 Building may require additional precautions if power is not available to ventilation fan.

- 5.13 ____ IF B 4160V UNIT BUS is
energized,
THEN ensure AHF-152
"EFT-2 ENC Vent Fan" runs
for > 10 min prior to entry
(Entrance to EFT-2).

EFT-2 TRANSFER TO ALTERNATE TANKS FOR COOLING

ACTIONSDETAILS

- 5.14 ____ Open EFV-96
"EFT-2 DRAIN"
(Inside EFT-2 Building
north wall).
-

- 5.15 ____ Ensure transfer hose is not
leaking.

NOTE

The next step may result in a rapid decrease in EFT-2 level.

- 5.16 ____ Notify Control Room EFT-2
alignment to FST-1A
is in progress.
-

- 5.17 ____ Open FSV-919
"FST-1A DRAIN AND
SAMPLE VALVE"
(Southeast side of FST-1A).
-

- 5.18 ____ Close CDV-288
"FST TO CDT-1
CROSS-TIE DRAIN"
(119 ft Berm by FST-1A).

EFT-2 TRANSFER TO ALTERNATE TANKS FOR COOLING

ACTIONSDETAILS

5.19 ____ Open CDV-289
"FST TO CDT-1
CROSS-TIE ISO"
(119 ft Berm by FST-1A).

5.20 ____ Open FSV-918
"FST TO CDT-1
CROSS-TIE ISO"
(119 ft Berm by FST-1A).

5.21 ____ Unlock and close EFV-111
"TO EFW PUMP SUCTION"
(Inside EFT-2 Building
northwest corner).

5.22 ____ Unlock and close EFV-109
"TO EFW PUMP SUCTION"
(Inside EFT-2 Building
north wall).

5.23 ____ **EXIT** this enclosure.

ALIGNING UNIT 1 OR 2 STEAM TO EFP-2

ACTIONS

DETAILS

NOTE

If EFP-2 is the only available FW source, then not aligning Unit 1 or 2 steam may require EFP-2 to be cycled on and off based on available steam pressure.

- 6.1 IF Unit 1 or 2 steam is available,
 AND 95 ft IB is accessible,
 THEN notify SPO to perform warmup and pressurization of AS line to EFP-2
- 1 Throttle ASV-15
 "AS ISO TO EFP-2"
 1 turn open
 (119 ft TB NW stairs).
- 2 WHEN steam PRESS is equalized around ASV-15,
 THEN open ASV-15
- 3 Blowdown condensate from ASDT-2 by cycling ASV-110
 "ASDT-2 BLOWDOWN"
 (95 ft TB behind Atmospheric Drain Tank).
- 4 WHEN AS lines are warmed and free of condensate,
 THEN notify Control Room.
-
- 6.2 WHEN AS lines are warmed and pressurized,
 THEN notify PPO to blowdown MSDT-21
- Blowdown condensate from MSDT-21 by throttling open MSV-290
 "MSDT-21 BLOWDOWN"
 (95 ft IB by EFP-2).

ALIGNING UNIT 1 OR 2 STEAM TO EFP-2

ACTIONS

DETAILS

6.3 ____ WHEN AS is ready to be aligned to EFP-2,
THEN notify PPO to align Unit 1 or 2 steam to EFP-2

1 ____ Ensure MSDT-21 is free of condensate and close MSV-290
"MSDT-21 BLOWDOWN"
(95 ft IB by EFP-2).

2 ____ Open ASV-23
"UNITS 1 OR 2 STEAM TO EFP-2"
(95 ft IB by EFP-2).

6.4 ____ **EXIT** this enclosure.

EFP-2 CROSS-TIE TO A TRAIN EFW

ACTIONSDETAILSSTATUS

- A ES 4160V BUS is energized by the A ES Diesel or Alternate AC Diesel.
- B ES 4160V BUS is de-energized.
- EFP-2 cross-tie to A Train EFW is desired.

7.1 — Verify ASV-50
"EFP-2 TRIP &
THROTTLE VALVE"
is not tripped.

- "EF PUMP 2 TRIP" annunciator alarm
(H-07-04) not lit.

— IF ASV-50 is tripped,
THEN notify SPO to perform
Enclosure 15, "EFP-2 TRIP
RECOVERY" in this
procedure.

EFP-2 CROSS-TIE TO A TRAIN EFW

ACTIONS

DETAILS

7.2 ___ Ensure EFP-2 normal
 discharge path is isolated.

1 ___ Depress "MANUAL PERMISSIVE"
 push buttons on
 EFIC channels A and B.

2 Close EFP-2 discharge block valves:

 ___ EFV-11

 ___ EFV-32

3 Notify PPO to open EFP-2 discharge
 block valve switches
 (A ES 480V SWGR Room):

 ___ DPDP 8C-1
 "EFV-11 MOTOR POWER"

 ___ DPDP 8C-3
 "EFV-32 MOTOR POWER"

7.3 ___ Start EFP-2

 • Open ASV-204

EFP-2 CROSS-TIE TO A TRAIN EFW

ACTIONS

DETAILS

7.4 ____ Notify PPO to cross connect
EFW trains.

1 Unlock and close EFV-12 switches
(A ES 480V SWGR Room):

____ DPDP 8C-5
"EFV-12 MOTOR POWER"

____ DPDP 8C-6
"EFV-12 CONTROL POWER"

2 ____ Depress the open push button on
EFV-12-MST
(A ES 480V SWGR Room).

3 ____ WHEN EFV-12 is open,
THEN open and lock EFV-12
switches
(A ES 480V SWGR Room):

____ DPDP 8C-5
"EFV-12 MOTOR POWER"

____ DPDP 8C-6
"EFV-12 CONTROL POWER"

4 ____ Notify Control Room that EFV-12
is open.

7.5 ____ WHEN EFP-2 is aligned to
supply EFW to OTSGs,
THEN stop EFP-3

EFP-2 CROSS-TIE TO A TRAIN EFW

ACTIONS

DETAILS

7.6 ☐ Depress both
 "EFW INITIATE"
 push buttons on
 EFIC channels A and B.

7.7 ☐ Ensure EFW flow is
 controlled.

[Rule 3, EFW/AFW Control]

7.8 ☐ **EXIT** this enclosure.

TRANSFERRING HOTWELL TO EFT-2 USING EFP-2

ACTIONSDETAILSSTATUS

All the following exist:

- B-Battery failed
- Water sources on berm depleted
- Hotwell transfer to EFT-2 using EFP-2 is desired

8.1 ____ IF hotwell is NOT at atmospheric PRESS, THEN break condenser vacuum.

1 Close all MSIVs:

____ MSV-412

____ MSV-413

____ MSV-414

____ MSV-411

2 ____ Control OTSG PRESS using ADVs.

3 Select condenser ARPs to "PULL TO LOCK":

____ ARP-1A

____ ARP-1B

4 Open condenser vacuum Bkrs:

____ ARV-48

____ ARV-49

TRANSFERRING HOTWELL TO EFT-2 USING EFP-2

ACTIONSDETAILS

8.2 ____ Ensure EFP-2 EFW block valves are closed.

- ____ EFV-11
- ____ EFV-32

8.3 ____ WHEN condenser is at atmospheric PRESS, THEN notify SPO to align EFP-2 to hotwell.

- 1 ____ Ensure EFV-36
"EFW & AFW SUCTION ISO FROM HOTWELL" is open (95 ft TB between C & D inlet waterboxes).
- 2 ____ Unlock and open EFV-1
"EFP-2 SUCTION FROM CONDENSER" (95 ft IB by EFP-2).
- 3 ____ Unlock and close EFV-4
"EFP-2 SUCTION FROM EFT-2" (95 ft IB by EFP-2).

8.4 ____ Start EFP-2

- Open ASV-204

TRANSFERRING HOTWELL TO EFT-2 USING EFP-2

ACTIONS

DETAILS

8.5 WHEN hotwell \leq 24 in,
 OR EFT-2 is at desired level,
 THEN stop EFP-2

- Close ASV-204

8.6 **EXIT** this enclosure.

START UP AND SHUTDOWN OF EFW/AFW PUMPS

ACTIONSDETAILS**CAUTION**

Ensure adequate diesel loading margin is available before starting EFP-1

- 9.1 IF EFP-1 start is desired from hotwell,
 THEN ensure flow path is properly aligned and start EFP-1
- 1 Ensure condenser is at atmospheric PRESS.
 - 2 Ensure EFV-36
 "EFW & AFW SUCTION ISO FROM HOTWELL" is open
 (95 ft TB between C & D inlet waterboxes).
 - 3 Unlock and open EFV-2
 "EFP-1 SUCTION FROM CONDENSER"
 (95 ft IB by EFP-1).
 - 4 Unlock and close EFV-3
 "EFP-1 SUCTION FROM EFT-2"
 (95 ft IB by EFP-1).
 - 5 Ensure EFP-1 EFIC control valves are closed.
 - 6 Ensure EFP-3 is in
 "PULL TO LOCK".
 - 7 Start EFP-1 and ensure EFW flow is controlled.
- [Rule 5, Diesel Load Control]
- 8 Ensure EFW flow is maintained
 < limit of EOP-14, Emergency Operating Procedures Enclosures,
 Figure 3

START UP AND SHUTDOWN OF EFW/AFW PUMPS

ACTIONSDETAILS**CAUTION**

Ensure adequate diesel loading margin is available before starting EFP-1

- 9.2 ____ IF EFP-1 start is desired from EFT-2, THEN ensure flow path is properly aligned and start EFP-1
- 1 ____ OPEN EFV-109
"EFT-2 TO EFW PUMP SUCTION"
(119 ft berm inside EFT-2 Building).
 - 2 ____ Open EFV-111
"EFT-2 TO EFW PUMP SUCTION"
(119 ft Berm inside EFT-2 Building).
 - 3 ____ Unlock and open EFV-3
"EFP-1 SUCTION FROM EFT-2"
(95 ft IB by EFP-1).
 - 4 ____ Unlock and close EFV-2
"EFP-1 SUCTION FROM CONDENSER"
(95 ft IB by EFP-1).
 - 5 ____ Ensure EFP-1 EFIC control valves are closed.
 - 6 ____ Ensure EFP-3 is in "PULL TO LOCK".
 - 7 ____ Start EFP-1 and ensure EFW flow is controlled.

[Rule 5, Diesel Load Control]
 - 8 ____ Ensure EFW flow is controlled.

[Rule 3, EFW/AFW Control]

START UP AND SHUTDOWN OF EFW/AFW PUMPS

ACTIONS

DETAILS

9.3 ____ IF EFP-2 start is desired
from hotwell,
THEN ensure flow path is
properly aligned and start
EFP-2

1 ____ Ensure condenser is at atmospheric
PRESS.

2 ____ Ensure EFV-36
"EFW & AFW SUCTION ISO FROM
HOTWELL" is open
(95 ft TB between C & D inlet
waterboxes).

3 ____ Unlock and open EFV-1
"EFP-2 SUCTION FROM
CONDENSER"
(95 ft IB by EFP-2).

4 ____ Unlock and close EFV-4
"EFP-2 SUCTION FROM EFT-2"
(95 ft IB by EFP-2).

5 ____ Ensure EFP-2 EFIC control valves
are closed.

6 Start EFP-2 by opening 1 of the
following:

____ ASV-5

____ ASV-204

7 ____ Ensure EFW flow is controlled.

[Rule 3, EFW/AFW Control]

START UP AND SHUTDOWN OF EFW/AFW PUMPS

ACTIONS

DETAILS

9.4 ____ IF EFP-2 start is desired
from EFT-2,
THEN ensure flow path is
properly aligned and start
EFP-2

- 1 ____ OPEN EFV-109
"EFT-2 TO EFW PUMP SUCTION"
(119 ft berm inside EFT-2 Building).
- 2 ____ Open EFV-111
"EFT-2 TO EFW PUMP SUCTION"
(119 ft Berm inside EFT-2 Building).
- 3 ____ Unlock and open EFV-4
"EFP-2 SUCTION FROM EFT-2"
(95 ft IB by EFP-2).
- 4 ____ Unlock and close EFV-1
"EFP-2 SUCTION FROM
CONDENSER"
(95 ft IB by EFP-2).
- 5 ____ Ensure EFP-2 EFIC control valves
are closed.
- 6 Start EFP-2 by opening 1 of the
following:
____ ASV-5
____ ASV-204
- 7 ____ Ensure EFW flow is controlled.

[Rule 3, EFW/AFW Control]

START UP AND SHUTDOWN OF EFW/AFW PUMPS

ACTIONSDETAILS

9.5 ____ IF EFP-3 start is desired,
THEN ensure flow path is
 properly aligned and start
 EFP-3

1 ____ IF starting EFP-3 from EFT-2,
THEN ensure the following valves
 are open:

____ EFV-109
 "EFT-2 TO EFW PUMP
 SUCTION"
 (119 ft berm inside
 EFT-2 Building)

____ EFV-111
 "EFT-2 TO EFW PUMP
 SUCTION"
 (119 ft Berm inside
 EFT-2 Building)

2 ____ IF EFP-3 will NOT be aligned
 to EFT-2,
THEN ensure proper suction flow
 path exists.

3 ____ Ensure EFP-3 EFIC control valves
 are closed.

4 ____ Ensure EFP-1 is in
 "PULL TO LOCK".

5 ____ Depress "MANUAL PERMISSIVE"
 push button on EFIC channel A.

6 ____ Select EFP-3 to
 "NORMAL AFTER STOP".

7 ____ Reset the fuel rack on
 EFP-3 diesel (119 ft Berm inside
 EFP-3 Building).

8 ____ Start EFP-3

9 ____ Ensure EFW flow is controlled.

[Rule 3, EFW/AFW Control]

START UP AND SHUTDOWN OF EFW/AFW PUMPS

ACTIONSDETAILSNOTE

AP-770, Emergency Diesel Actuation will energize 4160V REACTOR AUX BUS 3 using the Alternate AC Diesel.

9.6 ____ IF FWP-7 start is desired from CDT-1, THEN ensure flow path is properly aligned and start FWP-7

1 ____ Ensure CDT-1 level \geq 5 ft.

2 ____ Ensure CDV-102 "CDT-1 LOWER ISO" is open (119 ft Berm by CDT-1).

3 ____ OPEN FWV-214 "FWP-7 SUCTION FROM CDT-1" (95 ft TB by FWP-7).

4 ____ Close FWV-213 "FWP-7 SUCTION FROM HOTWELL" (95 ft TB by FWP-7).

5 ____ Ensure all AFW control valves are closed.

6 ____ Start FWP-7

[Rule 5, Diesel Load Control]

START UP AND SHUTDOWN OF EFW/AFW PUMPS

ACTIONSDETAILS

9.7 ____ IF FWP-7 start is desired
from hotwell,
THEN ensure flow path is
properly aligned and start
FWP-7

1 ____ Ensure condenser is at atmospheric
PRESS.

2 ____ Ensure hotwell level \geq 48 in.

3 ____ Ensure EFV-36
"EFW & AFW SUCTION ISO FROM
HOTWELL" is open
(95 ft TB between C & D inlet
waterboxes).

4 ____ Open FWV-213
"FWP-7 SUCTION FROM
HOTWELL"
(95 ft TB by FWP-7).

5 ____ Close FWV-214
"FWP-7 SUCTION FROM CDT-1"
(95 ft TB by FWP-7).

6 ____ Ensure all AFW control valves are
closed.

7 ____ Start FWP-7

[Rule 5, Diesel Load Control]

START UP AND SHUTDOWN OF EFW/AFW PUMPS

ACTIONS

DETAILS

9.8 ____ IF FWP-7 start is desired from EFT-2,
THEN ensure flow path is properly aligned and start FWP-7

- 1 ____ Ensure EFT-2 level \geq 9 ft.
- 2 ____ Ensure EFP-1 and EFP-2 are not running.
- 3 ____ OPEN EFV-109
"EFT-2 TO EFW PUMP SUCTION"
(119 ft berm inside EFT-2 Building).
- 4 ____ Ensure EFV-3 is open
"EFP-1 SUCTION FROM EFT-2"
(95 ft IB by EFP-1).
- 5 ____ Unlock and open EFV-2
"EFP-1 SUCTION FROM CONDENSER"
(95 ft IB by EFP-1).
- 6 ____ Open FWV-213
"FWP-7 SUCTION FROM HOTWELL"
(95 ft TB by FWP-7).
- 7 ____ Close FWV-214
"FWP-7 SUCTION FROM CDT-1"
(95 ft TB by FWP-7).
- 8 ____ Close EFV-36
"EFW & AFW SUCTION ISO FROM HOTWELL"
(95 ft TB between C & D inlet waterboxes).
- 9 ____ Ensure all AFW control valves are closed.
- 10 ____ Start FWP-7

[Rule 5, Diesel Load Control]

START UP AND SHUTDOWN OF EFW/AFW PUMPS

ACTIONSDETAILS

9.9 ____ IF stopping any EFW
OR AFW pump is desired,
THEN stop affected pump.

1 ____ IF EFP-1 shutdown is desired,
THEN select EFP-1 to
 "PULL TO LOCK".

2 ____ IF EFP-2 shutdown is desired,
THEN perform the following in
 order:

____ Depress "MANUAL
 PERMISSIVE" push button
 on EFIC channel B.

____ Close ASV-204

____ Close ASV-5

3 ____ IF EFP-3 shutdown is desired,
AND EFP-3 is aligned to EFT-2,
THEN perform the following in
 order:

____ Depress "MANUAL
 PERMISSIVE" push button
 on EFIC channel A.

____ Stop EFP-3

4 ____ IF EFP-3 shutdown is desired,
AND EFT-2 is isolated,
THEN select EFP-3 to
 "PULL TO LOCK".

5 ____ IF FWP-7 shutdown is desired,
THEN stop FWP-7

9.10 ____ **EXIT** this enclosure.

EFP-1 TO DHR TRANSITION

ACTIONSDETAILSSTATUS

All the following exist:

- EFP-1 starting desired
- B ES 4160V BUS not energized
- A ES Diesel or Alternate AC Diesel supplying power to A ES 4160V BUS
- DHR not in service
- LPI not required

10.1 ____ Ensure available load margin
on running diesel.

- Ensure all the following are not running:

____ DHP-1A

____ RWP-3A

____ DCP-1A

____ BSP-1A

____ AHF-15A

- ____ Ensure BAST OFF/REMOTE
switch for CAT-5A Heater CAHE-
3A is selected to "OFF"
- ____ Ensure BWST Htr control switch
selected to "LOCAL"

EFP-1 TO DHR TRANSITION

ACTIONS

DETAILS

10.2 ____ Start EFP-1

- 1 ____ Ensure proper suction flow path exists.
- 2 ____ IF EFP-3 is running,
 THEN stop select EFP-3 to
 "PULL TO LOCK".
- 3 Ensure EFP-1 EFIC control valves are closed:

 ____ EFV-58

 ____ EFV-57
- 4 ____ Start EFP-1

 [Rule 5, Diesel Load Control]
- 5 ____ Ensure EFW flow is controlled.

 [Rule 3, EFW/AFW Control]

EFP-1 TO DHR TRANSITION

ACTIONSDETAILS

10.3 ____ WHEN transition to DHR is required,
THEN stop EFP-1

1 ____ Raise level in available OTSGs to > 90%.

2 Close EFP-1 EFIC control valves

____ EFV-58

____ EFV-57

3 ____ Select EFP-1 to "PULL TO LOCK".

10.4 ____ Transition to DHR using applicable EOP or AP.

10.5 ____ **EXIT** this enclosure.

EFP-1 ALIGNMENT TO A EDG WITHOUT LOAD MANAGEMENT

ACTIONSDETAILSSTATUS

All the following exist:

- EFP-1 starting desired
- BOTH ES 4160V Buses energized by diesels
- Stopping SWP-1A or RWP-2A not desired
- DHR not in service
- LPI not required

11.1 ____ Ensure CC ventilation and
CC chiller is aligned to
B ES 4160V BUS.

- Refer to EOP-14, Enclosure 17, Control
Complex Emergency Ventilation and
Cooling, for guidance.

11.2 ____ Ensure available diesel load
margin for starting EFP-1

- Ensure all the following are not running:

____ DHP-1A

____ RWP-3A

____ DCP-1A

____ BSP-1A

____ AHF-15A

EFP-1 ALIGNMENT TO A EDG WITHOUT LOAD MANAGEMENT

ACTIONSDETAILS

11.3 ____ Start EFP-1

1 ____ Ensure a proper suction flow path exists.

2 ____ IF EFP-3 is running,
THEN select EFP-3 to
"PULL TO LOCK".3 Ensure EFP-1 EFIC control valves are
closed:

____ EFV-58

____ EFV-57

4 ____ Start EFP-1

[Rule 5, Diesel Load Control]

5 ____ Ensure EFW flow is controlled.

[Rule 3, EFW/AFW Control]

11.4 ____ WHEN transition to DHR is
required,
THEN ensure DHR is
aligned to the
B ES 4160V BUS.

- Transition to DHR using applicable EOP
or AP.

11.5 ____ **EXIT** this enclosure.

ALIGNING EFW/AFW PUMPS TO HOTWELL

ACTIONSDETAILS

12.1 ____ Ensure hotwell is at
atmospheric PRESS.

1 Close all MSIVs:

____ MSV-412

____ MSV-413

____ MSV-414

____ MSV-411

2 ____ Control OTSG PRESS using ADVs.

3 Select condenser ARPs to
"PULL TO LOCK":

____ ARP-1A

____ ARP-1B

4 Open condenser vacuum Bkrs:

____ ARV-48

____ ARV-49

12.3 ____ WHEN hotwell is at
atmospheric PRESS,
THEN notify SPO to
determine hotwell TEMP.

• Record hotwell TEMP:

CD-53-TI

"CDHE-4A SOUTHSIDE
TEMPERATURE": _____ °F
(95 ft TB south of A hotwell)

CD-55-TI

"CDHE-4B SOUTHSIDE
TEMPERATURE": _____ °F
(95 ft TB south of B hotwell)

ALIGNING EFW/AFW PUMPS TO HOTWELL

ACTIONSDETAILS

12.4 ____ Verify hotwell is available.

- Verify all the following exist:

____ Hotwell level > 48 in

____ Hotwell TEMP < 139°F

____ IF hotwell is NOT available,
THEN EXIT this enclosure.

12.5 ____ IF EFP-1 alignment to the
hotwell is desired,
THEN align EFP-1 to hotwell.

1 ____ Ensure EFV-36
"EFW & AFW SUCTION ISO FROM
HOTWELL" is open
(95 ft TB between C & D inlet
waterboxes).

2 ____ Unlock and open EFV-2
"EFP-1 SUCTION FROM
CONDENSER"
(95 ft IB by EFP-1).

3 ____ Unlock and close EFV-3
"EFP-1 SUCTION FROM EFT-2"
(95 ft IB by EFP-1).

4 ____ IF EFP-1 start up is desired,
THEN CONCURRENTLY
PERFORM Enclosure 9 in this
procedure.

5 ____ Maintain total EFW flow \leq limits of
EOP-14, Emergency Operating
Procedures Enclosures, Figure 3

ALIGNING EFW/AFW PUMPS TO HOTWELL

ACTIONSDETAILS

12.6 ____ IF EFP-2 alignment to the hotwell is desired, THEN align EFP-2 to hotwell.

1 ____ Ensure EFV-36 "EFW & AFW SUCTION ISO FROM HOTWELL" is open (95 ft TB between C & D inlet waterboxes).

2 ____ Unlock and open EFV-1 "EFP-2 SUCTION FROM CONDENSER" (95 ft IB by EFP-2).

3 ____ Unlock and close EFV-4 "EFP-2 SUCTION FROM EFT-2" (95 ft IB by EFP-2).

4 ____ IF EFP-2 start up is desired, THEN CONCURRENTLY PERFORM Enclosure 9 in this procedure.

5 ____ Maintain total EFW flow \leq limits of EOP-14, Emergency Operating Procedures Enclosures, Figure 3

ALIGNING EFW/AFW PUMPS TO HOTWELL

ACTIONSDETAILS

12.7 ____ IF FWP-7 alignment to the hotwell is desired, THEN align FWP-7 suction from hotwell.

- 1 ____ Ensure EFV-36 "EFW & AFW SUCTION ISO FROM HOTWELL" is open (95 ft TB between C & D inlet waterboxes).
- 2 ____ Open FWV-213 "FWP-7 SUCTION FROM HOTWELL" (95 ft TB by FWP-7).
- 3 ____ Close FWV-214 "FWP-7 SUCTION FROM CDT-1" (95 ft TB by FWP-7).
- 4 ____ IF FWP-7 start up is desired, THEN CONCURRENTLY PERFORM Enclosure 9 in this procedure.

12.8 ____ IF at any time hotwell level is ≤ 24 in, THEN ensure adequate suction source exists.

- Perform 1 of the following:
 - ____ Transfer pump suction to alternate supply.
 - ____ Refill hotwell.
 - ____ Stop any running EFW or AFW pump aligned to the hotwell.

12.9 ____ WHEN no running EFW OR AFW pump is aligned to the hotwell, THEN EXIT this enclosure.

REFILLING FST-1A/1B FROM UNIT 1 OR 2 FIRE SYSTEM

ACTIONS

DETAILS

- 13.1 ____ Notify CR-1/2 Control Room that FST filling evolution will be performed.

NOTE

FST-1A or 1B is full when level is 36 ft (Approximately 9,860 gal = 1 ft.)

- 13.2 ____ Start FST-1A fill.

- 1 ____ Ensure FSV-27
"FST-1A INLET ISO"
is open
(119 ft Berm between FSTs).
- 2 ____ IF FST-1A and FST-1B are NOT
cross-tied,
THEN ensure FSV-28
"FST-1B INLET ISO" is closed
(119 ft Berm between FSTs).
- 3 Open 1 of the following valves:
 - ____ FSV-25
"UNIT 1 & 2 FILL ISOLATION TO
UNIT 3 FIRE SERVICE"
(95 ft West of Berm outside
protected area)
 - ____ FSV-285
"FSV-25 BYPASS"
(95 ft West of Berm outside
protected area)

REFILLING FST-1A/1B FROM UNIT 1 OR 2 FIRE SYSTEM

ACTIONSDETAILS

13.3 ____ WHEN FSTs are at desired level,
THEN stop FST fill.

1 ____ Close FSV-25
"UNIT 1 & 2 FILL ISOLATION TO
UNIT 3 FIRE SERVICE"
(95 ft West of Berm outside
protected area).

2 ____ Close FSV-285
"FSV-25 BYPASS"
(95 ft West of Berm outside
protected area).

3 ____ IF FST-1A and FST-1B are NOT
cross-tied,
THEN perform the following:

____ Open FSV-28
"FST-1B INLET ISO"
(119 ft Berm between FSTs).

____ Close FSV-27
"FST-1A INLET ISO"
(119 ft Berm between FSTs).

13.4 ____ **EXIT** this enclosure.

ALIGNING EFW PUMPS TO EFT-2

ACTIONSDETAILS

14.1 ____ Ensure EFT-2 level is ≥ 9 ft.

14.2 ____ Verify CDT-1 level is ≥ 5 ft.

____ IF CDT-1 level is < 5 ft,
THEN ensure CDV-103
"CDT-1 TO EFP SUCTION"
is closed
(119 ft Berm by CDT-1).

14.3 ____ IF EFP-1 alignment to EFT-2
is desired,
THEN align EFP-1 to EFT-2

1 ____ Ensure EFV-109
"EFT-2 TO EFW PUMP SUCTION"
is open
(119 ft berm inside EFT-2 Building).

2 ____ Ensure EFV-111
"EFT-2 TO EFW PUMP SUCTION"
is open
(119 ft Berm inside EFT-2 Building).

3 ____ Unlock and open EFV-3
"EFP-1 SUCTION FROM EFT-2"
(95 ft IB by EFP-1).

4 ____ Unlock and close EFV-2
"EFP-1 SUCTION FROM
CONDENSER"
(95 ft IB by EFP-1).

ALIGNING EFW PUMPS TO EFT-2

ACTIONSDETAILS

14.4 ____ IF EFP-2 alignment to EFT-2
is desired,
THEN align EFP-2 to EFT-2

1 ____ Ensure EFV-109
"EFT-2 TO EFW PUMP SUCTION"
is open
(119 ft berm inside
EFT-2 Building).

2 ____ EFV-111
"EFT-2 TO EFW PUMP SUCTION"
is open
(119 ft Berm inside
EFT-2 Building).

3 ____ Unlock and open EFV-4
"EFP-2 SUCTION FROM EFT-2"
(95 ft IB by EFP-2).

4 ____ Unlock and close EFV-1
"EFP-2 SUCTION FROM
CONDENSER"
(95 ft IB by EFP-2).

14.5 ____ **EXIT** this enclosure.

EFP-2 TRIP RECOVERY

ACTIONS

DETAILS

CAUTION

If EFP-2 trip recovery follows an OTSG overfill event ensure MS lines and EFP-2 steam supply header are drained prior to performing EFP-2 trip recovery.

15.1 ____ Ensure cause of the EFP-2 trip has been identified and corrected.

15.2 ____ Ensure EFP-2 steam supply isolation valves are closed.

- ____ ASV-5
- ____ ASV-204

15.3 ____ Ensure EFP-2 normal discharge path is isolated.

1 ____ Depress "MANUAL PERMISSIVE" push buttons on EFIC channels A and B.

2 Close EFP-2 EFIC control valves:

____ EFV-55

____ EFV-56

EFP-2 TRIP RECOVERY

ACTIONSDETAILS

15.4 ____ Notify SPO to reset ASV-50
(95 ft IB by EFP-2).

1 ____ Turn handwheel clockwise to raise
latch collar.

2 ____ Ensure tappet and tappet nut are
fully depressed.

3 ____ Engage latch lever.

4 ____ Slowly open ASV-50 by turning
handwheel counterclockwise until
full open.

5 ____ Notify Control Room to verify
Annunciator alarm "EF PUMP 2
TRIP" (H-07-04) clears.

15.5 ____ Notify Control Room EFP-2
is reset.

15.6 ____ **EXIT** this enclosure.

EFP-1/EFP-3 CROSS-TIE TO B TRAIN EFW

ACTIONSDETAILSSTATUS

- EFP-1/EFP-3 cross-tie to B Train EFW is desired.

16.1___ Ensure EFP-1 / EFP-3
normal discharge path is
isolated.

1 ___ Depress "MANUAL PERMISSIVE"
push buttons on
EFIC channels A and B.

2 Close EFP-1/ EFP-3 discharge block
valves:

___ EFV-14

___ EFV-33

3 Notify PPO to open EFP-1 / EFP-3
discharge block valve switches
(B ES 480V SWGR Room):

___ DPDP 8D-1
"EFV-14 MOTOR POWER"

___ DPDP 8D-3
"EFV-33 MOTOR POWER"

EFP-1/EFP-3 CROSS-TIE TO B TRAIN EFW

ACTIONSDETAILS

16.2 ____ IF EFV-12 power available,
THEN notify PPO to open
EFV-12 electrically.

1 Unlock and close EFV-12 switches
(A ES 480V SWGR Room):

____ DPDP 8C-5
"EFV-12 MOTOR POWER"

____ DPDP 8C-6
"EFV-12 CONTROL POWER"

2 ____ Depress the open push button on
EFV-12-MST
(A ES 480V SWGR Room).

3 ____ WHEN EFV-12 is open,
THEN open and lock EFV-12
switches
(A ES 480V SWGR Room):

____ DPDP 8C-5
"EFV-12 MOTOR POWER"

____ DPDP 8C-6
"EFV-12 CONTROL POWER"

____ IF EFV-12 power is NOT
available,
THEN notify PPO to open
EFV-12 manually.
(95 ft IB by EFP-1)

16.3 ____ IF EFP-2 is NOT running,
THEN close EFP-2 EFIC
control valves.

• Close EFP-2 EFIC control valves:

____ EFV-55

____ EFV-56

EFW-1/EFW-3 CROSS-TIE TO B TRAIN EFW

ACTIONS

DETAILS

16.4 ____ Start one of the following:

____ EFP-1

[Rule 5, Diesel Load Control]

____ EFP-3

16.5 ____ Depress both
"EFW INITIATE"
push buttons on
EFIC channels A and B.

16.6 ____ IF EFP-2 is running,
THEN stop EFP-2

16.7 ____ Ensure EFW flow is
controlled.

[Rule 3, EFW/AFW Control]

16.8 ____ **EXIT** this enclosure.

EFT-2 TEMPORARY TRANSFER LINE CONFIGURATION

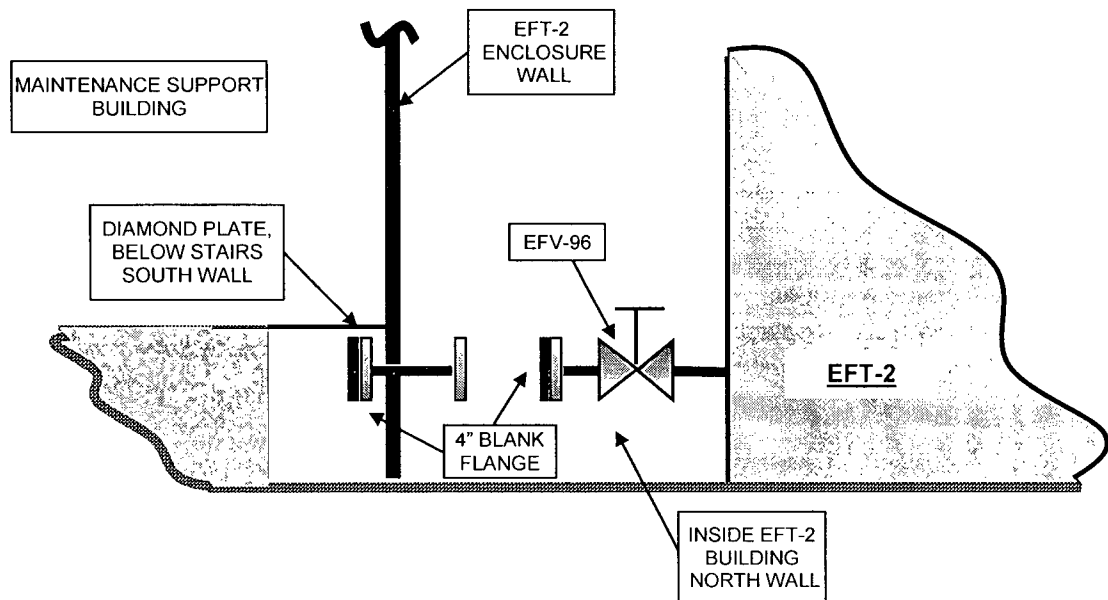


FIGURE 1 - CONFIGURATION OF EFT-2 PIPING
AT BEGINING ENCLOSURE 4.0

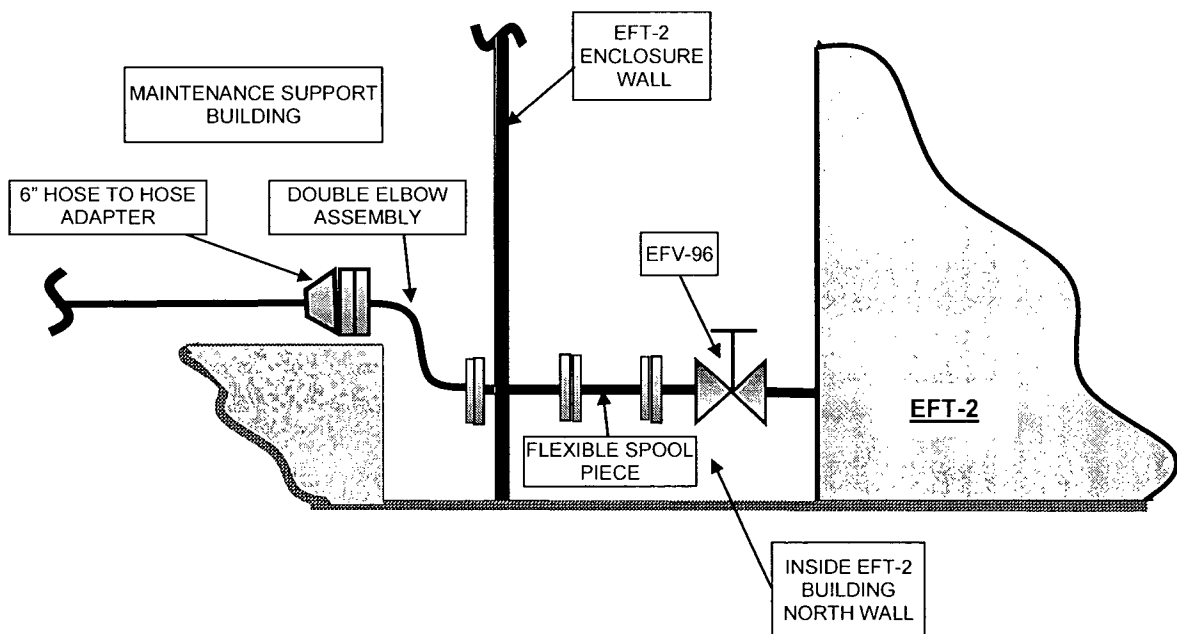


FIGURE 2 - CONFIGURATION OF EFT-2 TRANSFER LINE
CONNECTION AT THE END OF ENCLOSURE 4, STEP 4.11

EFP-2 TEMPORARY TRANSFER LINE CONFIGURATION

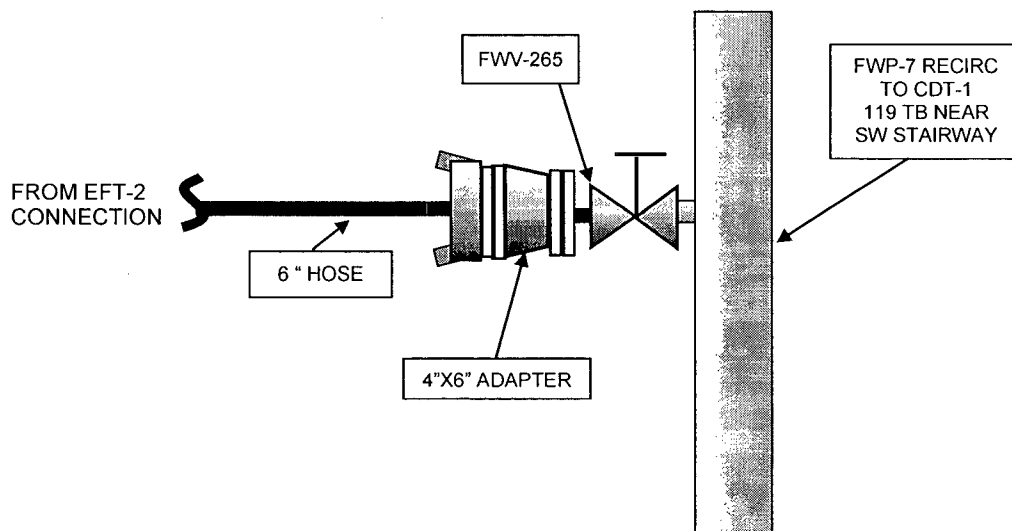


FIGURE 3 - CONFIGURATION OF EFT-2 CONNECTIONS TO CDT-1 AT THE END OF ENCLOSURE 4, STEP 4.16

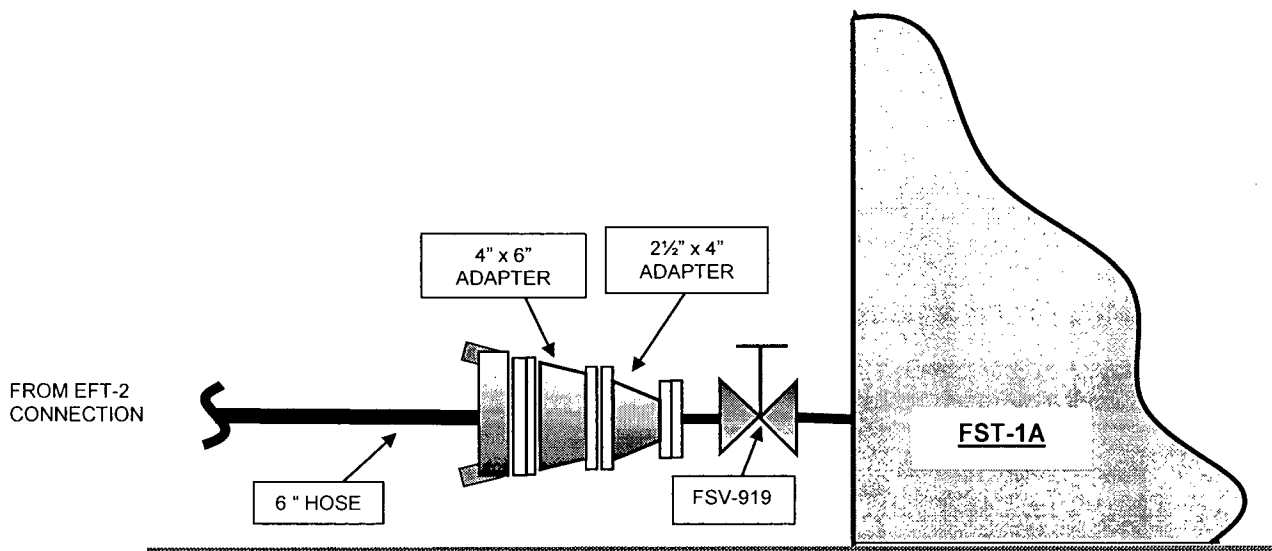


FIGURE 4 - CONFIGURATION OF FST-1A SOUTHEAST SIDE AT THE END OF ENCLOSURE 4, STEP 4.25

SUMMARY OF CHANGES
PRR 437102

- NOTE:**
1. Writers and Reviewers: Ensure that any changes to this procedure that affect information contained in ERF posters, Enclosures, briefing cards, guidelines, etc. are made to those items as well.
 2. Writers and Reviewers: Changes to certain parts of this procedure may impact guidance in EM-225 Enclosure 11.

| SECTION | CHANGE |
|--|--|
| Throughout | Reformatting IAW PRO-NGGC-0201 |
| 4.0.3 | Deleted duplicate TSC Accident Assessment Team responsibilities (PRR 437102) |
| Enclosure 15 Page 1 of 2 Step 15.1 | Added the word ensure to include an action verb. |
| Enclosure 15 Page 2 of 2 | Replaced "EFT-2 Trip" Recovery with "EFP-2 Trip Recovery" (PRR 475803) |