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Rev. 3

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EMERGENCY PLAN IMPLEMENTING PROCEDURE

EM-225A

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

POST ACCIDENT RB HYDROGEN CONTROL

APPROVED BY: Procedure Owner

  
(SIGNATURE ON FILE)

DATE: 8/7/2000

PROCEDURE OWNER: Manager, Nuclear Plant Operations

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## **1.0**

### **PURPOSE**

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 Generating Complex personnel during an emergency at CR-3.

## **2.0**

### **REFERENCES**

## **2.1**

### **DEVELOPMENTAL REFERENCES**

- 2.1.1 FSAR Chapter 14 Appendix B
- 2.1.2 MAR 91-05-03-01, "Hydrogen Purge Redundancy Restoration"
- 2.1.3 MAR 93-05-03-02, "Hydrogen Purge Redundancy Restoration, Elect. & I&C"
- 2.1.4 CALC M-99-0051, "Mission Dose Assessment"
- 2.1.5 CALC I-90-0013, "Post Accident Reactor Building Hydrogen Purge Flow Accuracy"
- 2.1.6 CALC M-90-0056, "Hydrogen Mini Purge Pressure Loss"
- 2.1.7 CALC M-99-0052, "Zone Environmental Radiation Dose for LOCA"
- 2.1.8 CALC M-97-0137, "Control Room Habitability Analysis Considering LOCA Without Loop"
- 2.1.9 CALC M-98-0014, "MHA Off Site and Hydrogen Purge Incremental Dose"
- 2.1.10 CALC M-85-1004, "H2 Generation Rate"
- 2.1.11 CALC I-90-0023, "RB Hydrogen Concentration Loop Accuracy"

## **3.0 PERSONNEL INDOCTRINATION**

### **3.1 DEFINITIONS**

- 3.1.1 Off-shore winds - winds originating from NNE to SE sectors (011.2° to 146.3°). The most common time for this to occur is midnight.

### **3.2 RESPONSIBILITIES**

#### **3.2.1 Emergency Coordinator (EC) or designee**

- Approves RB purge prior to initiation (Enclosure 6).
- Ensures coordination with off-site agencies prior to initiation of RB purges.

#### **3.2.2 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).

#### **3.2.3 Dose Assessment Team**

- Monitors meteorological conditions and predicts when off-shore winds should exist.
- Projects off-site doses for proposed RB purges.

#### **3.2.4 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.

### 3.2.5 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.

### 3.2.6 Radiation Monitoring Team

- Evaluates actual plant radiological conditions and determine routes to be used (see Enclosure 9).

### 3.2.7 Operations

- Performs RB purge per Enclosure 7.

## 3.3 LIMITS AND PRECAUTIONS

3.3.1 All hydrogen concentration values referenced in this procedure are presented in % by volume as indicated on the hydrogen analyzers.

3.3.2 Maintain RB hydrogen concentration < 3.6% to provide adequate margin below the lower flammability limit of 4.1% for hydrogen in air.

3.3.3 Travel through radiation areas should be as shown in Enclosure 9 unless otherwise directed by the emergency RWP.

3.3.4 Purging should be performed under favorable meteorological conditions (off-shore winds) whenever possible.

3.3.5 RB pressure must be carefully controlled during purge evolutions to prevent ES actuations from high RB pressure.

3.3.6 The purging criteria established by this procedure is not valid during Severe Accidents.

3.3.7 Mission dose calculations credit 10 days of radioactive decay when determining the dose received for performance of local actions. Taking local actions prior to this time may result in excessive radiation exposure.

3.3.8 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.

3.3.9 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.

#### 4.0 INSTRUCTIONS

##### **NOTE**

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

- 4.1 IF RCS LOCA conditions exist,  
THEN monitor RB hydrogen concentration in accordance with Enclosure 1, Hydrogen Monitoring, of this procedure.
- 4.2 IF at any time RB hydrogen concentration  $\geq 1\%$   
THEN perform Enclosure 2, Initial Preparations For Purging, of this procedure.
- 4.3 WHEN at any time RB purge compressors arrive on site,  
AND radiological conditions permit,  
THEN perform Enclosure 3, Portable Compressor Installation, of this procedure.
- 4.4 WHEN RB hydrogen concentration  $\geq 3.3\%$ ,  
AND radiological conditions permit,  
THEN perform Enclosure 4, Prerequisite Field Actions, of this procedure.
- 4.5 WHEN RB hydrogen concentration  $\geq 3.4\%$ ,  
THEN perform Enclosure 5, RB Pressurization For Hydrogen Purge, of this procedure.
- 4.6 WHEN RB hydrogen concentration  $\geq 3.5\%$ ,  
THEN begin Enclosure 6, Purge Release Authorization Form, of this procedure.
- 4.7 WHEN any of the following conditions exist:  
\_\_\_ RB H<sub>2</sub> concentration  $\geq 3.5\%$  for  $\geq 24$  hours  
\_\_\_ RB H<sub>2</sub> concentration  $\geq 3.5\%$  and off shore winds exist  
\_\_\_ RB H<sub>2</sub> concentration  $\geq 3.6\%$   
THEN perform Enclosure 7, Purging RB, of this procedure.
- 4.8 WHEN RB purge is stopped,  
THEN GO TO step 4.6 or this procedure.

HYDROGEN MONITORING

STATUS

- LOCA Conditions Exist

ACTIONS

DETAILS

1.1 \_\_\_ Ensure one H<sub>2</sub> analyzer is aligned and placed in service (Ops).

- \_\_\_ Ensure applicable steps of EOP-14, Enclosure 2, PPO Post Event Actions, have been completed for H<sub>2</sub> analyzers.
- \_\_\_ IF H<sub>2</sub> analyzer problems exist, THEN refer to EM-308, Post Accident Monitoring of the Reactor Building Atmosphere using the Containment Hydrogen Monitoring System.

1.2 \_\_\_ Plot RB H<sub>2</sub> concentration on Enclosure 8 of this procedure (AAT).

- Obtain H<sub>2</sub> concentrations from either of the following:
  - \_\_\_ EOP-14, Enclosure 21, RB Hydrogen Monitor Log.
  - \_\_\_ RECALL

HYDROGEN MONITORING (Cont'd)

1.3  Project when RB H<sub>2</sub> concentration will exceed action levels of this procedure (AAT).

- Use H<sub>2</sub> concentration plotted on Enclosure 8 of this procedure.
- Extrapolate to estimate time when H<sub>2</sub> concentration will reach procedure action levels.

<u>Action Level</u>	<u>Date</u>	<u>Time</u>
H <sub>2</sub> ≥ 1%	_____	_____
H <sub>2</sub> ≥ 3.3%	_____	_____
H <sub>2</sub> ≥ 3.4%	_____	_____
H <sub>2</sub> ≥ 3.5%	_____	_____
H <sub>2</sub> ≥ 3.6%	_____	_____

1.4  IF at anytime H<sub>2</sub> concentration is ≥ an action level of this procedure, THEN immediately notify the Accident Assessment Team Coordinator (AAT).

- Action levels based on RB H<sub>2</sub> concentrations.

<u>Action Level</u>	<u>Required Action</u>
H <sub>2</sub> ≥ 1%	See step 4.2
H <sub>2</sub> ≥ 3.3%	See step 4.4
H <sub>2</sub> ≥ 3.4%	See step 4.5
H <sub>2</sub> ≥ 3.5%	See step 4.6

1.5  Continue monitoring RB H<sub>2</sub> concentration (AAT).

- Plot RB H<sub>2</sub> concentration on Enclosure 8 of this procedure every 8 hours.
- Perform step 1.3 of this Enclosure every 8 hours.

INITIAL PREPARATIONS FOR PURGING

## STATUS

- RB H<sub>2</sub> Concentration  $\geq$  1%

ACTIONSDETAILS

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

PREPARATIONS FOR RB HYDROGEN PURGE (Cont'd)

ACTIONS

DETAILS

1.4 \_\_\_ Ensure all CCHE habitability breaches are sealed (ERT).

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1.5 \_\_\_ Monitor meteorological conditions to predict off-shore wind cycle (DAT).

- \_\_\_ Off-shore winds originate from NNE to SE sectors (011.2° to 146.3°).
  - \_\_\_ Most common time for off-shore winds is midnight.
- 

1.6 \_\_\_ Ensure the purge flow instrumentation cart is properly staged and equipped (ERT).

- \_\_\_ Refer to MP-815 for location of equipment.
  - \_\_\_ DO NOT install purge instruments until Enclosure 4 is performed.
- 

1.7 \_\_\_ Ensure power is available to LR-82-FI and LR-83-FI receptacle (OPS).

- \_\_\_ RX MCC 3B2 is energized.
  - \_\_\_ RX MCC 3B2, BKR 8AR closed.
  - \_\_\_ ACDP-20, BKR 12 closed. (143 ft AB near elevator)
- 

1.8 \_\_\_ Notify the Accident Assessment Team Coordinator that Enclosure 2 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 for locations of required actions/components and suggested routes.

- 1.2 \_\_\_ Connect portable air compressors (ERT).

- \_\_\_ DO NOT open LRV's at this time.
- \_\_\_ Indicate LRV's 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 - H<sub>2</sub> recombiner connections (119 ft IB outside west wall):  
(adapters in stores – FIMIS #01260356)

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

PORTABLE COMPRESSOR INSTALLATION (Cont'd)

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 is complete (OPS/ERT).

PREREQUISITE FIELD ACTIONS

STATUS

- RB H<sub>2</sub> Concentration  $\geq$  3.3%

ACTIONS

DETAILS

1.1 \_\_\_ Consult Radiation Monitoring Team to determine routes and precautions to be used while performing RB Purge Field Actions (ERT).

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

1.2 \_\_\_ Defeat all starting interlocks on AHF-7A and 7B (OPS).

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)
  - \_\_\_ AHF-7A, Ventilation MCC 3A-10C
  - \_\_\_ AHF-7B, Ventilation MCC 3B-9C

1.3 \_\_\_ Open RB exhaust dampers for emergency operation (OPS).

- Align 3 way valves on door of air handling panel 13 to point to the right (143 ft AB Ventilation Equipment Area):
  - \_\_\_ Emergency operation of AHD-95, AHD-96, and AHD-94
  - \_\_\_ Emergency operation of AHD-97, AHD-98, and AHD-94

PREREQUISITE FIELD ACTIONS (Cont'd)

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

RB PRESSURIZATION FOR HYDROGEN PURGE

STATUS

- RB H<sub>2</sub> Concentration ≥ 3.4%
- Portage Air Compressors are installed.

ACTIONS

DETAILS

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

- Refer to Enclosure 9 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 ≈ 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 \_\_\_\_\_ 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 ≈ 2 psig.

RB PRESSURIZATION FOR HYDROGEN PURGE (Cont'd)

ACTIONS

DETAILS

1.3 \_\_\_ IF portable air compressors were connected to H<sub>2</sub> recombiner connections, THEN start air supply to RB and establish and maintain RB PRESS at ≈ 2 psig (ERT/Ops).

- 1 \_\_\_ Start portable air compressors.
- 2 Open H<sub>2</sub> recombiner connection isolations for operating air compressors (119 ft IB):

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

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

---

1.4 \_\_\_ WHEN RB PRESS is being maintained at ≈ 2 psig, THEN notify the Accident Assessment Team Coordinator that Enclosure 5 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 prior to initiating purge.**

EMERGENCY COORDINATOR APPROVAL \_\_\_\_\_ / \_\_\_\_\_  
Sign/Date

PURGING RB

STATUS

- RB Purge Is Required

ACTIONS

DETAILS

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

- \_\_\_ Enclosure 2 complete
- \_\_\_ Enclosure 3 complete
- \_\_\_ Enclosure 4 complete
- \_\_\_ Enclosure 5 complete

1.2 \_\_\_ Determine required purge flow rate (AAT/DAT).

- \_\_\_ IF H<sub>2</sub> purge has been previously performed, THEN use flows from previous purge.

- \_\_\_ IF H<sub>2</sub> purge has NOT been previously performed, THEN refer to Enclosure 10 to determine flows:

\_\_\_ Required Purge Flow \_\_\_ scfm

\_\_\_ Error Corrected Flow \_\_\_ scfm

- \_\_\_ Record Error Corrected Flow on Enclosure 6.

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

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

PURGING RB (Cont'd)

ACTIONS

DETAILS

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

PURGING RB (Cont'd)

STATUS

- EC has approved Purge Release Authorization Form, Enclosure 6

ACTIONS

DETAILS

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 (Cont'd)

ACTIONS

DETAILS

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

PURGING RB (Cont'd)

ACTIONS

DETAILS

- 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 H<sub>2</sub> recombiner  
                  \_\_\_    connections,  
                  \_\_\_    THEN adjust the compressor output to  
                  \_\_\_    maintain RB PRESS at ≈ 2 psig.

PURGING RB (Cont'd)ACTIONSDETAILS

1.10 WHEN all of the following exist:

- RB H<sub>2</sub> Concentration is  
     ≤ 3.5%  
 EC approves termination

THEN stop RB purge  
 (OPS/ERT).

1 Ensure the following valves are closed:

A Train	B Train
<input type="checkbox"/> LRV-70	<input type="checkbox"/> LRV-72
<input type="checkbox"/> LRV-71	<input type="checkbox"/> 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 H<sub>2</sub> recombiner connections,  
THEN close the following valves:

<input type="checkbox"/> LRV-87	<input type="checkbox"/> LRV-88
<input type="checkbox"/> LRV-89	<input type="checkbox"/> LRV-90
<input type="checkbox"/> LRV-91	<input type="checkbox"/> LRV-92
<input type="checkbox"/> LRV-93	<input type="checkbox"/> LRV-94

5 Stop portable air compressors.

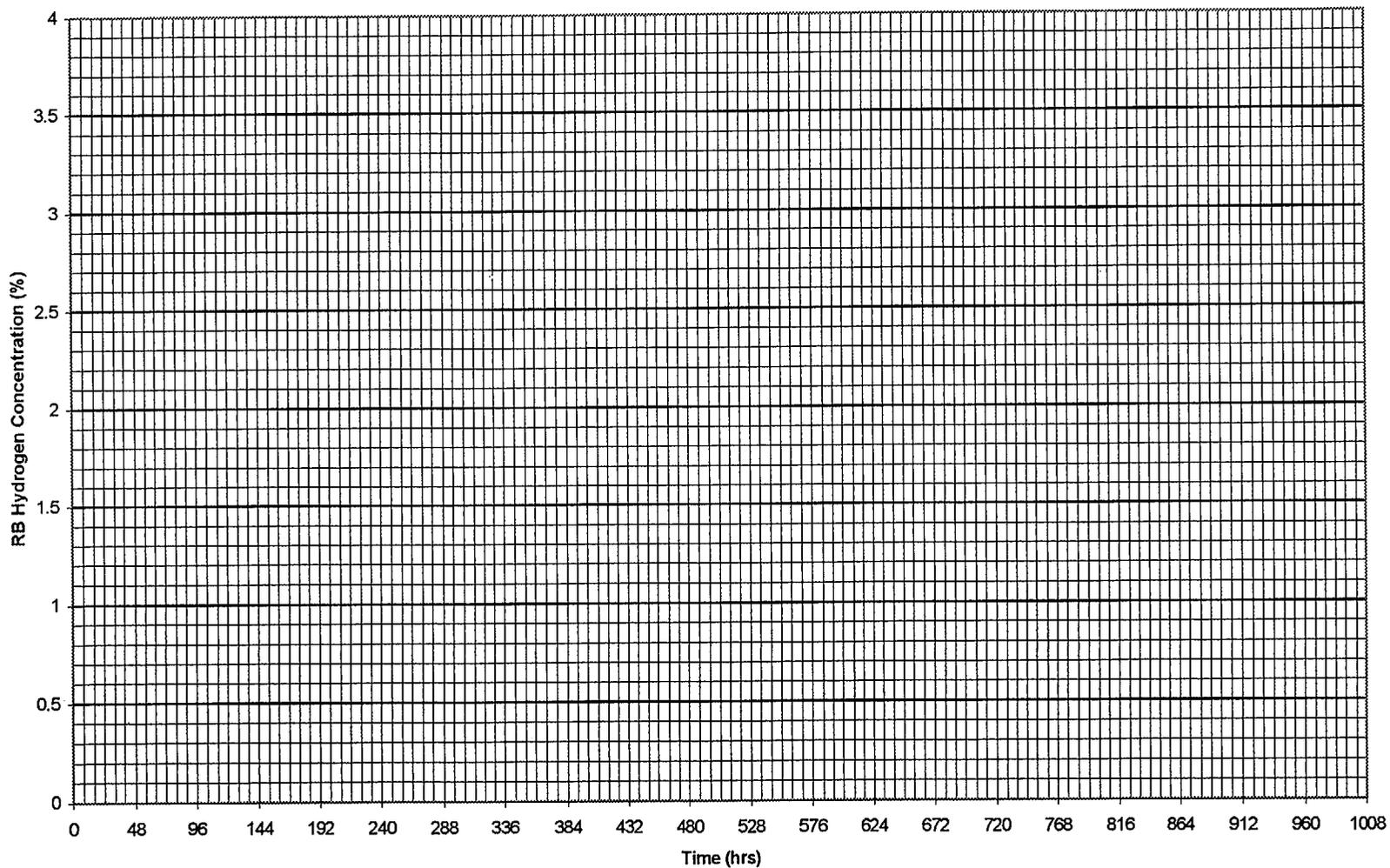
PURGING RB (Cont'd)

ACTIONS

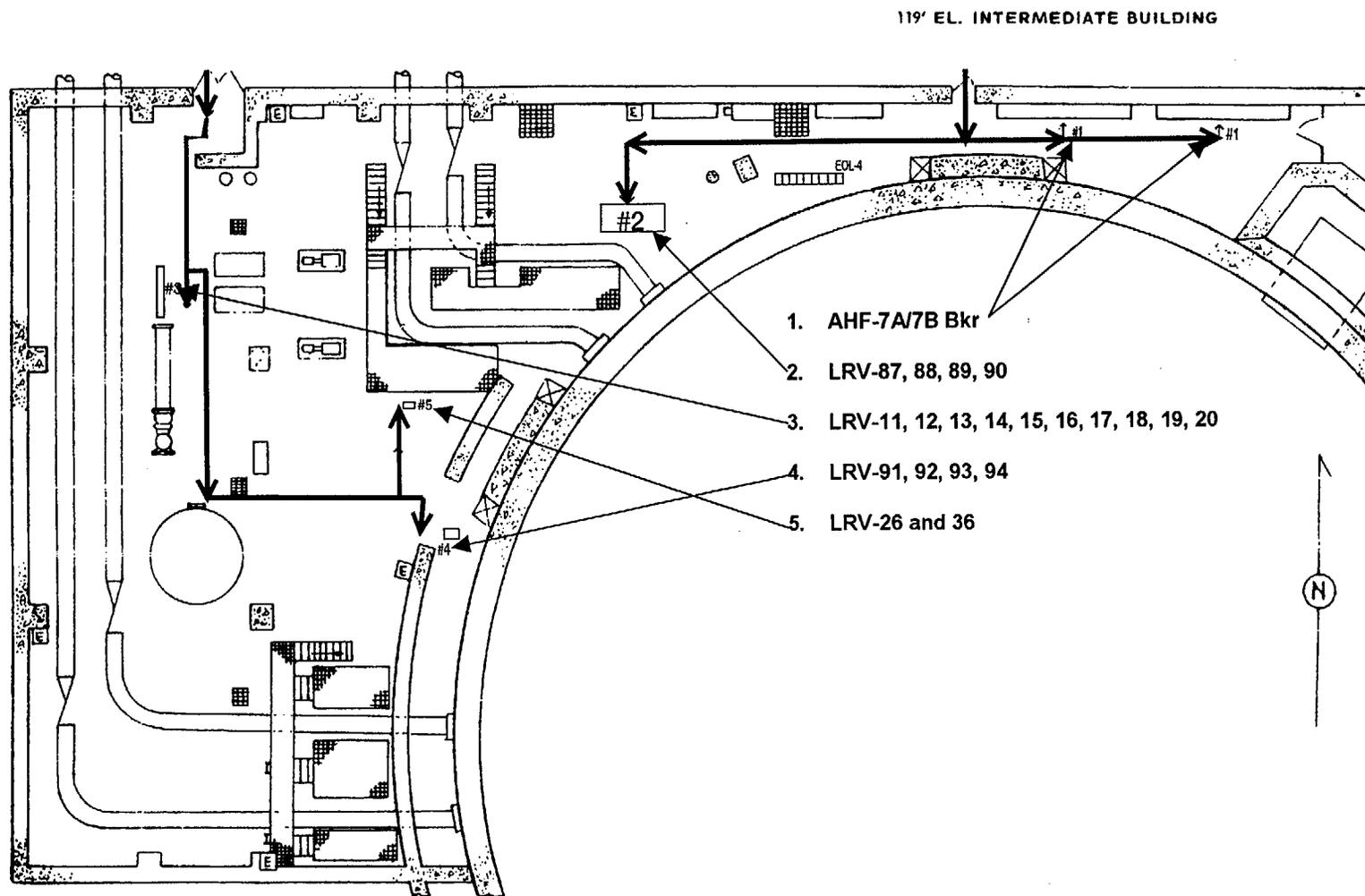
DETAILS

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

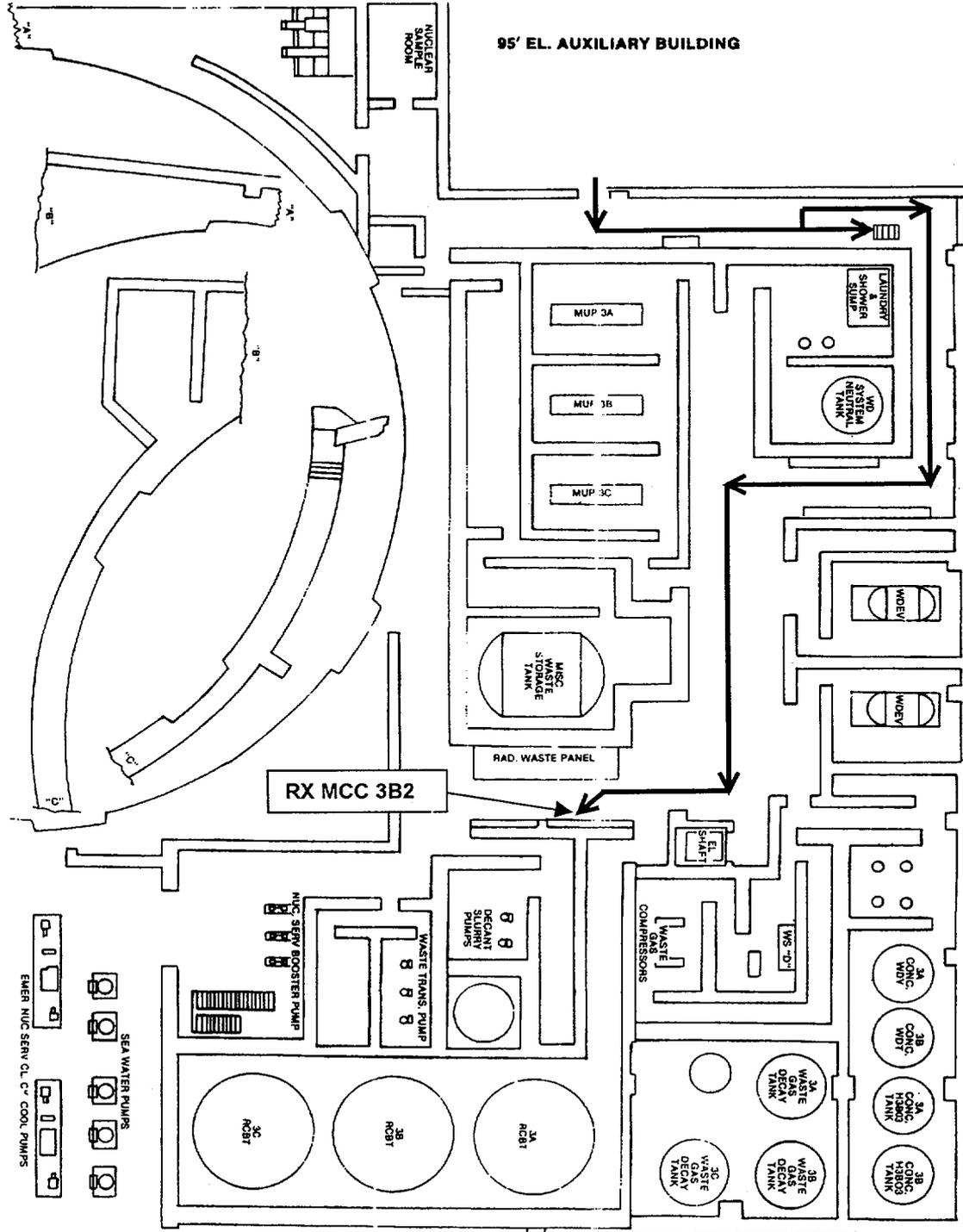
RB HYDROGEN CONCENTRATION TREND



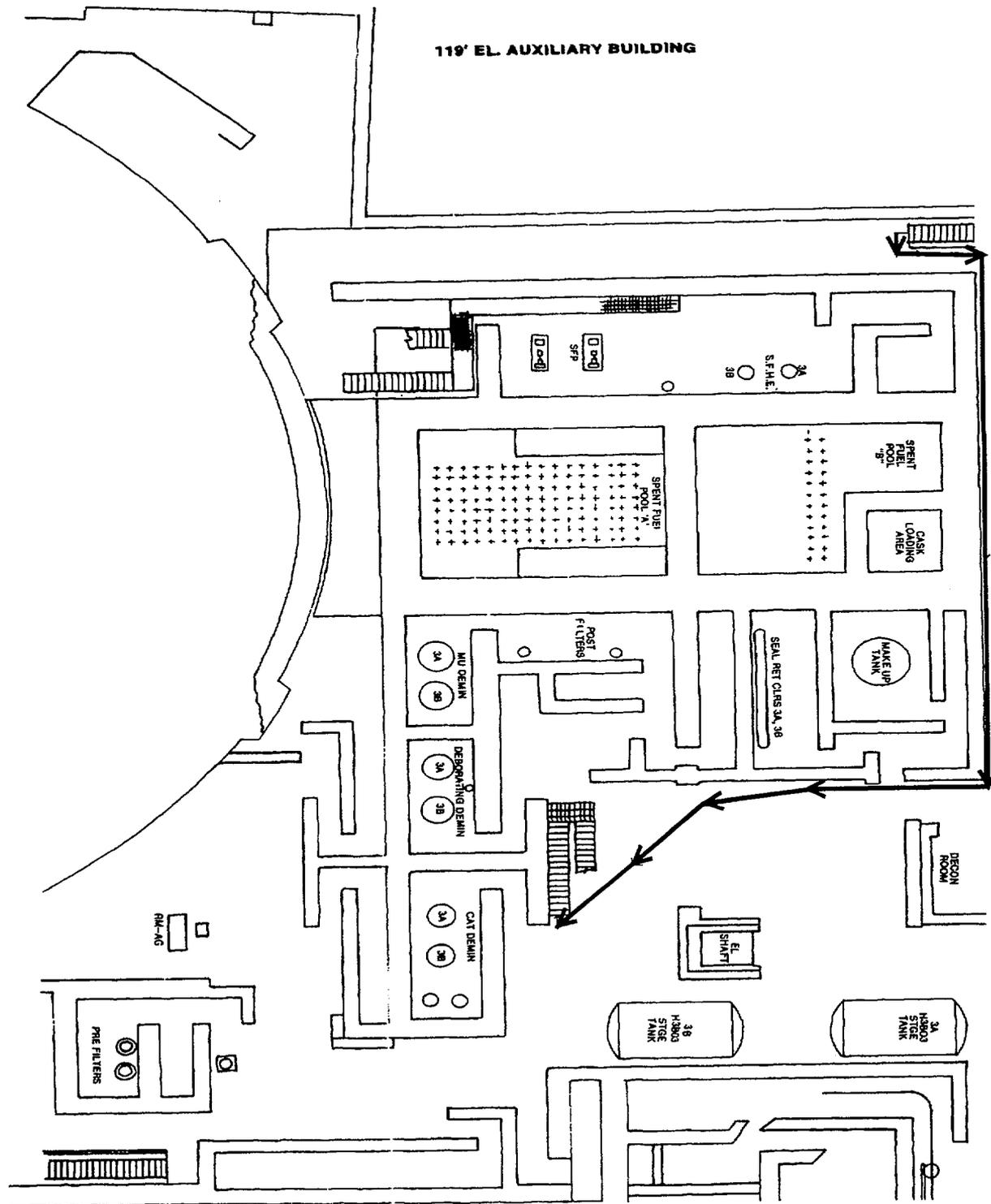
ACCESS ROUTES



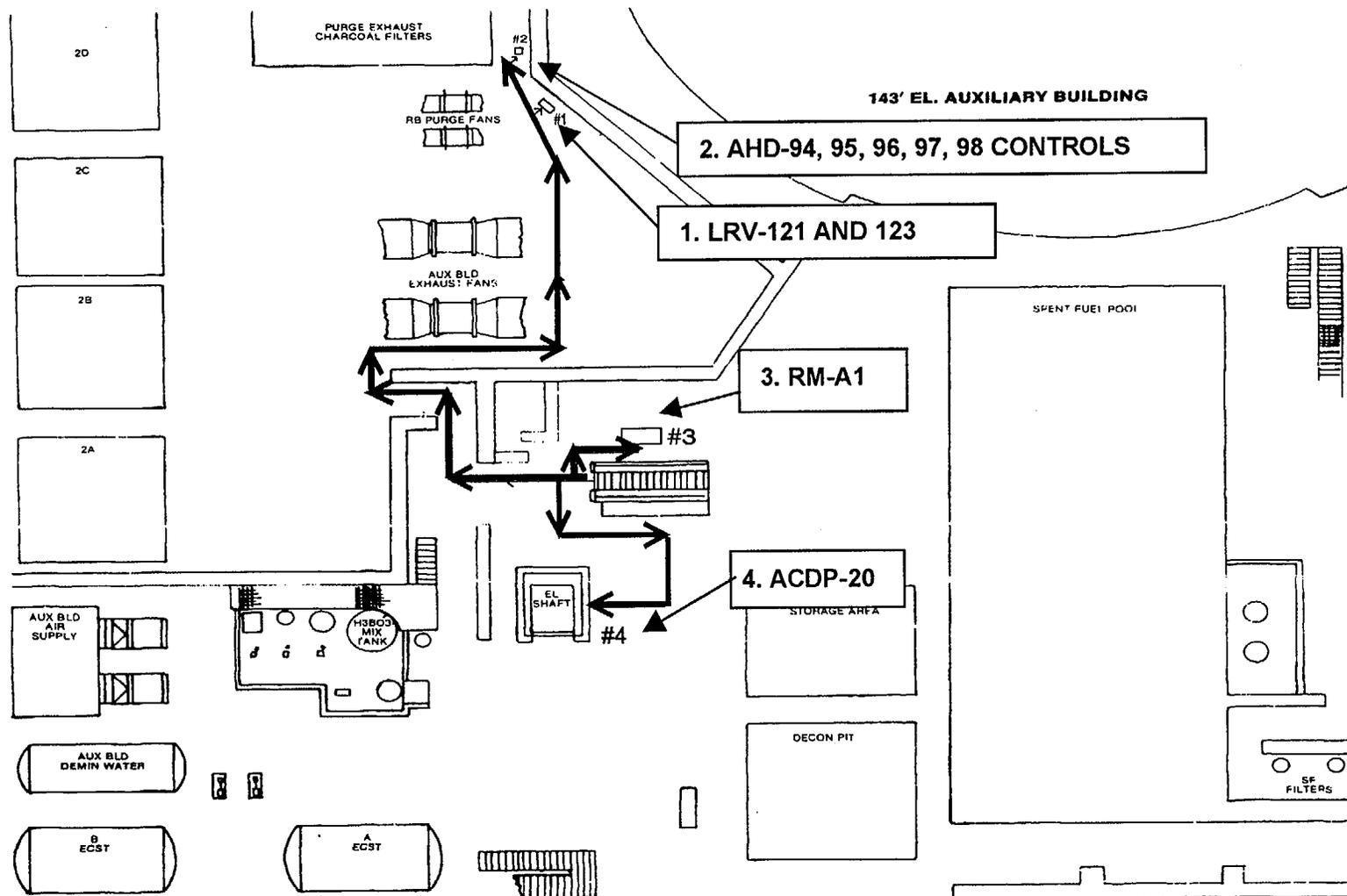
ACCESS ROUTES (Cont'd)



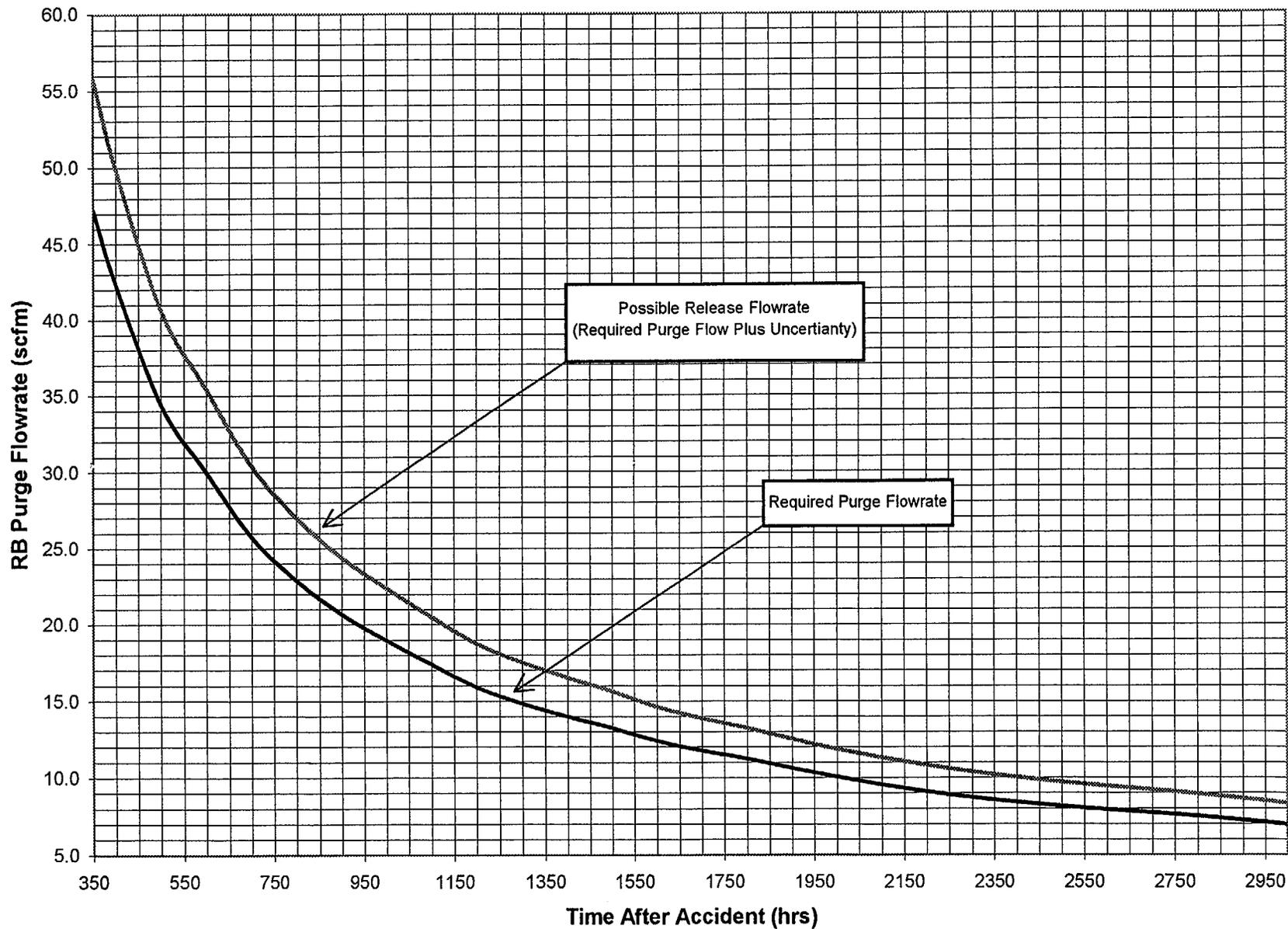
ACCESS ROUTES (Cont'd)



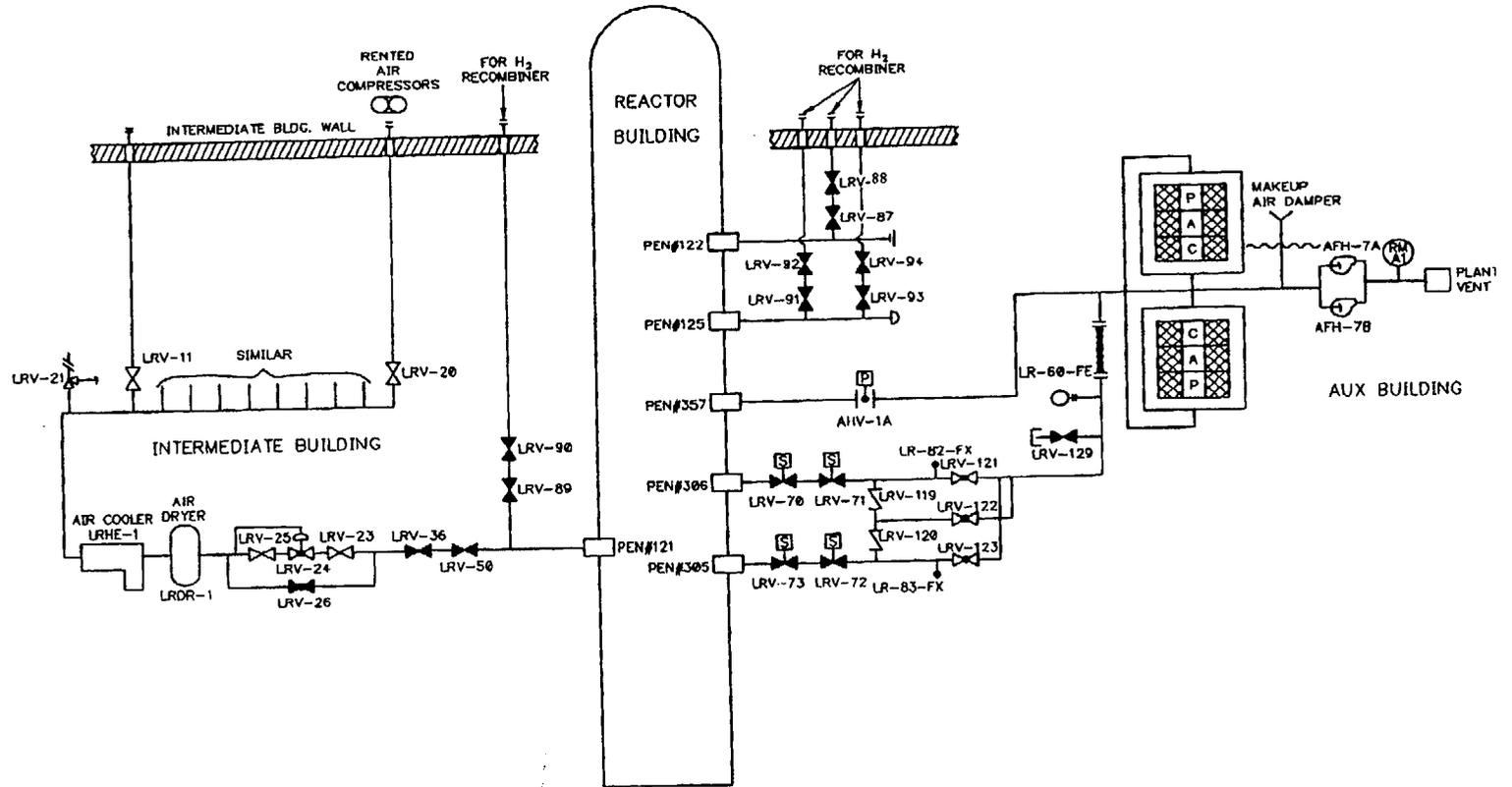
ACCESS ROUTES (Cont'd)



CONTINUOUS PURGE FLOW RATES AFTER A LOCA



HYDROGEN PURGE SYSTEM FLOW DIAGRAM



# PROCEDURE DEVELOPMENT AND REVISION RECORD

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Procedure: EM0225A

New Rev: 3

PRR#: 18541

Title: POST ACCIDENT RB HYDROGEN CONTROL

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## MINOR CHANGES

If Minor Changes are included, check the applicable box(es) and provide a list of affected steps.  
The following corrections are incorporated throughout:

- |   |  |
|---|--|
| <input type="checkbox"/> Sentence Structure   | <input checked="" type="checkbox"/> Redundant words or phrases           |
| <input type="checkbox"/> Punctuation  | <input type="checkbox"/> Abbreviations                                   |
| <input type="checkbox"/> Capitalization   | <input type="checkbox"/> Obviously incorrect units of measure            |
| <input type="checkbox"/> Spelling   | <input type="checkbox"/> Inadvertently omitted symbols (#, %, etc.)      |
| <input type="checkbox"/> Organizational Changes: position titles,<br>department names, or telephone numbers | <input checked="" type="checkbox"/> Obvious step numbering discrepancies |
|   | <input type="checkbox"/> Format  |

The following corrections are incorporated in the step(s) indicated: "Throughout" is used in lieu of Step# if a specific change affects a large number of steps.

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Correcting equipment nomenclature that does not agree with field labels or balance of procedure

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Changing information that is obviously incorrect and referenced correctly elsewhere

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Misplaced decimals that are neither setpoint values nor tolerances

---

Reference to a procedure when an approved procedure has taken the place of another procedure

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Fixing branching points when it is clear the branching steps were originally intended but were overlooked or incorrectly stated due to step number changes

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Adding clarifying information such as NOTES and CAUTIONS

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Adding words to clarify steps, NOTES, or CAUTIONS which clearly do not change the methodology or intent of the steps

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# PROCEDURE DEVELOPMENT AND REVISION RECORD

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Procedure: EM0225A

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## NON-INTENT CHANGES

Changes are incorporated for the reasons provided. "Throughout" is used in lieu of Step # if a specific change affects a large number of steps. For new or cancelled procedures the reason is provided.

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### Section 3.2 - Responsibilities

**3.2.1 - Deleted first three EC responsibilities. Basis - first three responsibilities were not specific to EM-225A**

**3.2.2 - Moved responsibility to keep the EC informed of RB conditions and releases from AAC (step 3.2.4 to AAT.**

**3.2.3 - Deleted DAT responsibility to determine "maximum" release rates. Basis - revised release permit no longer requires that maximum release rates be calculated.**

**3.2.4 (old) - Deleted AAC responsibilities. Basis - included with the AAT responsibilities (step 3.3.2).**

**3.2.4 (new) - Added procurement responsibility to obtain support materials for portable compressors.**

**3.2.7 Changed operations responsibility to perform Enclosure 7 vs Enclosure 1. Maintain consistency with other changes.**

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### Section 3.3 - Limits and Precautions

All L&P in section 3.3 renumbered.

**3.3.1 (new) - Added L&P to state that all H2 values are % by volume**

**3.3.1 (old) - Renumbered to 3.3.2. revised to raise maximum allowable concentration from 3.5% to 3.6%. Basis - procedure did not require purge initiation for 24 hours after reaching 3.5% therefore 3.5% limit was incorrect.**

**3.3.3 (old), Renumbered to 3.3.4 - revised to remove the terms "intermittently" and "continuously". Basis - procedure no longer addresses intermittent and continuous purges separately.**

**3.3.4 (old) - Deleted L&P. This L&P was not consistent with the rewrite.**

**3.3.8 (new) -Added L&P to consider making releases during periods of offshore winds if predictable pattern develops.**

**3.3.9 (new) - Added L&P stating that team responsibilities are specified after each step.**

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### Enclosure 9

**Enhanced the locations of the equipment and access routes to make it less confusing and more pronounced.**

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### Enclosure 10

**Enhanced the appearance of the curve and titles for human factors.**

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### Enclosure 11

**Added Enclosure 11 to give a system flow diagram of the Hydrogen Purge System. This gives a pictorial view of the valve arrangement to allow a good understanding of the procedure.**

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### Enclosure 6

**Rearranged and enhanced the information displayed on the Purge Release Authorization Form for human factor and maintain consistence with other changes.**

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### Section 2.0

**Eliminated implementing references to be consistence with the changes in AI-400C. Also added calculation I-90-0023 as a developmental reference.**

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# PROCEDURE DEVELOPMENT AND REVISION RECORD

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## CHANGE OF INTENT, CANCELLATION, OR NEW PROCEDURE

Changes are incorporated for the reasons provided. "Throughout" is used in lieu of Step # if a specific change affects a large number of steps. For new or cancelled procedures the reason is provided.

Section 4.0, Enclosure 1 and added Enclosure 2 through 5 and 7.

Section 4.0 and Enclosure 1 were completely rewritten. The sections were revised to enhance the procedure to eliminate confusion at key decision points. Added Enclosure 2 through 5 and 7 to separate action levels into separate enclosures. The original intent of the procedure has not changed but the actions to get to the point of purging the RB have been rearranged to make it clearer for the individual performing the actions. The procedure has been rearranged so those actions to perform major tasks are triggered from RB hydrogen concentration vs a projected time to reach the specific hydrogen concentration. These specific trigger points are summarized below:

- 1) With a LOCA existing, monitor RB hydrogen concentration.
- 2) At > 1 % hydrogen, start initial preparation for hydrogen purging. This involves notification to individuals to start preparing for possible hydrogen purge. This would involve the following type of activities:

- Obtaining air compressors.

- Evaluating plant radiological conditions to determine routes to perform activities in the auxiliary building.

- Monitoring meteorological conditions to predict off-shore wind cycle.

- Ensuring all CCHE habitability breaches are sealed

- Ensure the purge flow instrument cart is properly staged and equipped.

- Ensure power is available to LR-82-FI and LR-83-FI receptacle.

- Install air compressor when available and conditions allow.

1% hydrogen is a low enough value to have ample time to prepare for hydrogen purging requirements but not so low that unnecessary activity would occur early in the accident.

- 3) At > 3.3 % hydrogen and radiological conditions permit, in-plant field actions to set-up for the purge will start. At this concentration it is possible that a hydrogen purge will be performed and adequate decay time should have occurred, to permit access to the areas. The in-plant actions that will occur are summarized below:

- Defeat all starting interlocks on AHF-7A and 7B.

- Open RB exhaust dampers for emergency operation.

- Ensure RM-A1 is in service.

- Install Hydrogen purge flow instrumentation (LR-82-FI and LR-83-FI).

The dose calculation (Ref. M-99-0051) for these actions assumes they are performed 10 days after the start of the accident. Calculation M-85-1004 evaluated the hydrogen build-up rate based on RG 1.7 and determined that it would take approximately 12 days to get to 3.3% hydrogen (worse case of 2.8% for instrument uncertainty). Therefore, using 3.3% would be a good indicator that adequate decay time has occurred to attempt to perform the in-plant actions. To ensure the operators dose is not exceeded the requirements to verify radiological conditions to allow access to the area is also stipulated. The 3.3% also allows approximately 2 days to complete the in-plant actions before 3.5% is exceeded, based on calculation M-85-1004. This would be ample time to complete these actions.

- 4) At > 3.4% hydrogen the RB is pressurized by the portable air compressor installed after 1% hydrogen buildup. The RB is pressurized and maintained at approximately 2 psig to allow for a driving head to purge the RB. It is estimated that it will take more than 1 day for the hydrogen to increase by 0.1%, allowing sufficient time to pressurize the RB.

- 5) At > 3.5% hydrogen, the RB Purge Release Authorization Form will be completed and preparation to start purge, if any of following conditions exist.

- RB H2 concentration > 3.5% for > 24 hours

- RB H2 concentration > 3.5% and offshore wind exist

- RB H2 concentration > 3.6%

The preferred method is to purge when offshore winds exist. If the offshore winds do not exist when the RB reaches 3.5% then wait until offshore winds occur. If offshore wind do not occur within the next 24 hours or hydrogen build-up increases to 3.6% then start purging the RB and do not delay for offshore winds. The EC has the final authorization to allow purging with the approval of the Purge Release Authorization Form. The 3.5% ensures that the flammability limit of 4.1% is not exceeded.

The 3.6% adds an upper concentration level to ensure actions are taken to purge before the time margin factor is used up. The time margin factor allows a period of time (approximately 40 hours based on calculation M-85-1004) that the system can be taken out of service for maintenance, before the 4.1% is reached. Therefore the purge can be delayed for 24 hours or 0.1% after reaching 3.5% RB H<sub>2</sub> concentration before actions to purge are required.

6) After the RB purge is started, the purge will continue until the RB concentration stabilizes at < 3.5%. At that point the purge is stopped, with EC approval. The RB hydrogen concentration will continue to be monitored until item 5 above is met. Items 5 and 6 will continue to be performed until hydrogen production is eliminated.