ArevaEPRDCPEm Resource

From: WELLS Russell (AREVA) [Russell.Wells@areva.com]
Sent: Friday, July 22, 2011 10:30 AM
To: Tesfaye, Getachew
Cc: KOWALSKI David (AREVA); WILLIFORD Dennis (AREVA); BENNETT Kathy (AREVA); DELANO Karen (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No.462, FSAR Ch. 6, Supplement 4
Attachments: RAI 462 Supplement 4 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the ten questions in RAI No. 462 on February 25, 2011. Supplement 1 and Supplement 2 responses to RAI No. 462 were sent on April 14, 2011 and May 19, 2011, respectively, to provide a revised schedule. Supplement 3 response to RAI No. 462 was sent on June 29, 2011 to provide a technically correct and complete FINAL response to Question 06.04-5 and a revised schedule for responses to the remaining nine questions.

The attached file, "RAI 462 Supplement 4 Response US EPR DC.pdf" provides technically correct and complete FINAL responses to the remaining nine questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which supports the responses to RAI 462 Questions 06.02.03-8, 06.04-6, 06.04-7, 06.04-8, 06.05.01-2, 06.05.01-3 and 06.05.01-4.

The following table indicates the respective pages in the response document, "RAI 462 Supplement 4 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 462 — 06.02.03-7	2	2
RAI 462 — 06.02.03-8	3	3
RAI 462 — 06.04-6	4	5
RAI 462 — 06.04-7	6	8
RAI 462 — 06.04-8	9	10
RAI 462 — 06.05.01-2	11	11
RAI 462 — 06.05.01-3	12	13
RAI 462 — 06.05.01-4	14	17
RAI 462 — 06.05.01-5	18	20

The GOTHIC input decks referenced in this RAI response will be provided on a compact disc under a separate submittal and
are considered proprietary information.

This concludes the formal AREVA NP response to RAI 462, and there are no questions from this RAI for which AREVA NP has not provided responses.

Russ Wells for
Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262

Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, June 29, 2011 3:16 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No.462, FSAR Ch. 6, Supplement 3
Importance: High

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the ten questions in RAI No. 462 on February 25, 2011. Supplement 1 and Supplement 2 responses to RAI No. 462 were sent on April 14, 2011 and May 19, 2011, respectively, to provide a revised schedule.

The attached file, “RAI 462 Supplement 3 Response US EPR DC.pdf” provides a technically correct and complete FINAL response to Question 06.04-5.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which supports the response to RAI 462 Question 06.04-5.

The following table indicates the respective pages in the response document, “RAI 462 Supplement 3 Response US EPR DC.pdf,” that contain AREVA NP’s response to the subject question.

Question #	Start Page	End Page
RAI 462 — 06.04-5	2	3

The schedule for technically correct and complete responses to the remaining nine questions has changed and is provided below:

Question #	Response Date
RAI 462 — 06.02.03-7	**July 21, 2011**
RAI 462 — 06.02.03-8	**July 21, 2011**
RAI 462 — 06.04-6	**July 21, 2011**
RAI 462 — 06.04-7	**July 21, 2011**
RAI 462 — 06.04-8	**July 21, 2011**
RAI 462 — 06.05.01-2	**July 21, 2011**
RAI 462 — 06.05.01-3	**July 21, 2011**
RAI 462 — 06.05.01-4	**July 21, 2011**
RAI 462 — 06.05.01-5	**July 21, 2011**

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WELLS Russell (RS/NB)
Sent: Thursday, May 19, 2011 7:19 AM
To: Tesfaye, Getachew
Cc: WILLIFORD Dennis (RS/NB); KOWALSKI David (RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No.462, FSAR Ch. 6, Supplement 2

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the ten questions in RAI No. 462 on February 25, 2011. Supplement 1 response to RAI No. 462 was sent on April 14, 2011 to provide a revised schedule.

A revised schedule for technically correct and complete responses to the ten questions is provided below.

Question #	Response Date
RAI 462 — 06.02.03-7	June 30, 2011
RAI 462 — 06.02.03-8	June 30, 2011
RAI 462 — 06.04-5	June 30, 2011
RAI 462 — 06.04-6	June 30, 2011
RAI 462 — 06.04-7	June 30, 2011
RAI 462 — 06.04-8	June 30, 2011
RAI 462 — 06.05.01-2	June 30, 2011
RAI 462 — 06.05.01-3	June 30, 2011
RAI 462 — 06.05.01-4	June 30, 2011
RAI 462 — 06.05.01-5	June 30, 2011

Sincerely,

Russ Wells
U.S. EPR Design Certification Licensing Manager
AREVA NP, Inc.
3315 Old Forest Road, P.O. Box 10935
Mail Stop OF-57
Lynchburg, VA 24506-0935
Phone: 434-832-3884 (work)
434-942-6375 (cell)
Fax: 434-382-3884
Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)
Sent: Thursday, April 14, 2011 6:23 AM
To: 'Tesfaye, Getachew'
Cc: KOWALSKI David (RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No.462, FSAR Ch. 6, Supplement 1

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the ten questions in RAI No. 462 on February 25, 2011.

To provide additional time to interact with the NRC, a revised schedule is provided in this e-mail.

The schedule for technically correct and complete responses to the ten questions is provided below.

Question #	Response Date
RAI 462 — 06.02.03-7	May 19, 2011
RAI 462 — 06.02.03-8	May 19, 2011
RAI 462 — 06.04-5	May 19, 2011
RAI 462 — 06.04-6	May 19, 2011
RAI 462 — 06.04-7	May 19, 2011
RAI 462 — 06.04-8	May 19, 2011
RAI 462 — 06.05.01-2	May 19, 2011
RAI 462 — 06.05.01-3	May 19, 2011
RAI 462 — 06.05.01-4	May 19, 2011
RAI 462 — 06.05.01-5	May 19, 2011

Sincerely,

Russ Wells
U.S. EPR Design Certification Licensing Manager
AREVA NP, Inc.
3315 Old Forest Road, P.O. Box 10935
Mail Stop OF-57
Lynchburg, VA 24506-0935
Phone: 434-832-3884 (work)
434-942-6375 (cell)
Fax: 434-382-3884
Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)
Sent: Friday, February 25, 2011 2:57 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); BRYAN Martin (External RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No.462, FSAR Ch. 6

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 462 Response US EPR DC," provides a schedule since technically correct and complete responses to the ten questions are not provided.

The following table indicates the respective pages in the response document, "RAI 462 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 462 — 06.02.03-7	2	2
RAI 462 — 06.02.03-8	3	3
RAI 462 — 06.04-5	4	5
RAI 462 — 06.04-6	6	6

RAI 462 — 06.04-7	7	7
RAI 462 — 06.04-8	8	8
RAI 462 — 06.05.01-2	9	9
RAI 462 — 06.05.01-3	10	10
RAI 462 — 06.05.01-4	11	11
RAI 462 — 06.05.01-5	12	14

The schedule for technically correct and complete responses to these questions is provided below.

Question #	Response Date
RAI 462 — 06.02.03-7	April 14, 2011
RAI 462 — 06.02.03-8	April 14, 2011
RAI 462 — 06.04-5	April 14, 2011
RAI 462 — 06.04-6	April 14, 2011
RAI 462 — 06.04-7	April 14, 2011
RAI 462 — 06.04-8	April 14, 2011
RAI 462 — 06.05.01-2	April 14, 2011
RAI 462 — 06.05.01-3	April 14, 2011
RAI 462 — 06.05.01-4	April 14, 2011
RAI 462 — 06.05.01-5	April 14, 2011

Sincerely,

Russ Wells
U.S. EPR Design Certification Licensing Manager
AREVA NP, Inc.
3315 Old Forest Road, P.O. Box 10935
Mail Stop OF-57
Lynchburg, VA 24506-0935
Phone: 434-832-3884 (work)
434-942-6375 (cell)
Fax: 434-382-3884
Russell.Wells@Areva.com

From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Wednesday, January 26, 2011 3:04 PM
To: ZZ-DL-A-USEPR-DL
Cc: ODriscoll, James; Jackson, Christopher; McKirgan, John; Carneal, Jason; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No.462(5258_5259_5260), FSAR Ch. 6

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on December 8, 2010, and on January 20, 2011, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye

Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 3266

Mail Envelope Properties (1F1CC1BBDC66B842A46CAC03D6B1CD4104A2814F)

Subject: Response to U.S. EPR Design Certification Application RAI No.462, FSAR Ch. 6, Supplement 4
Sent Date: 7/22/2011 10:30:28 AM
Received Date: 7/22/2011 10:30:35 AM
From: WELLS Russell (AREVA)

Created By: Russell.Wells@areva.com

Recipients:
"KOWALSKI David (AREVA)" <David.Kowalski@areva.com>
Tracking Status: None
"WILLIFORD Dennis (AREVA)" <Dennis.Williford@areva.com>
Tracking Status: None
"BENNETT Kathy (AREVA)" <Kathy.Bennett@areva.com>
Tracking Status: None
"DELANO Karen (AREVA)" <Karen.Delano@areva.com>
Tracking Status: None
"ROMINE Judy (AREVA)" <Judy.Romine@areva.com>
Tracking Status: None
"RYAN Tom (AREVA)" <Tom.Ryan@areva.com>
Tracking Status: None
"Tesfaye, Getachew" <Getachew.Tesfaye@nrc.gov>
Tracking Status: None

Post Office: AUSLYNCMX02.adom.ad.corp

Files	**Size**	**Date & Time**
MESSAGE	10391	7/22/2011 10:30:35 AM
RAI 462 Supplement 4 Response US EPR DC.pdf	544257	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Response to

Request for Additional Information No. 462 (5258, 5259, 5260), Supplement 4

1/26/2011

U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 06.02.03 - Secondary Containment Functional Design
SRP Section: 06.04 - Control Room Habitability System
SRP Section: 06.05.01 - ESF Atmosphere Cleanup Systems

Application Section: 6.2.3

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)

Question 06.02.03-7:

In RAI 1, Question 6.2.1-10, RAI 89, Questions 6.2.3-3 and 6.2.3-4, and RAI #378 Question 6.2.3-6, The staff asked for details of the analysis used to support the functional capability of the EPR secondary containment in response to a LOCA. The staff requires information to review the EPR secondary containment design against SRP 6.2.3 Acceptance Criteria 1A through 1 H. The staff awaits response to RAI #378 Question 6.2.3-6. In addition, the staff requests the following information:

1. Provide the GOTHIC input deck used in this analysis in order for the staff to perform confirmatory analyses.
2. Specifically address SRP 6.2.3 1E. Was any credit taken for secondary containment out leakage?

Response:

1. The analysis considers two different models. In the first model, a single annulus ventilation system (AVS) accident train is modeled to simulate single failure after a design basis accident (DBA) loss-of-coolant accident (LOCA). In the second model, both AVS accident trains are modeled following a DBA LOCA.

   The GOTHIC input decks will be provided on a compact disc under a separate submittal and are considered proprietary information. The GOTHIC input files with one and both accident trains modeled are labeled AVS.SIN and AVS1.SIN, respectively.

2. No credit was taken for secondary containment out-leakage.

   Each model contains three flow paths with corresponding boundary conditions representing in-leakage from the primary containment, in-leakage from the environment and outflow from the AVS fan. There are no other leakage paths into or out of the secondary containment. Specifically, there is no leakage from the secondary containment.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 06.02.03-8:

In RAI 89, Questions 6.2.3-5, the staff requested details of the Containment Leak-off system along with an explanation on how it will capture bypass leakage. The staff requires the information in the RAI response to In order for the staff to review the EPR secondary containment design against SRP 6.2.3 Acceptance Criterion 4 Therefore include the RAI response in FSAR section 6.2.3.2.3.

Response to Question 06.02.03-8:

U.S. EPR FSAR Tier 2, Section 6.2.3.2.3 will be revised to include the information that was contained in the Response to RAI 89, Supplement 1, Question 06.02.03-5.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 6.2.3.2.3 will be revised as described in the response and indicated on the enclosed markup.

Question 06.04-6:

Follow-up to RAI 89, Question 06.04-3

The EPR FSAR revision 2 Tier 1 ITAAC 6.1 markup shows a new, separate CRE overpressure acceptance criteria for normal lineup. The new AC for CRE overpressure is significantly less than that specified in tier 2 as the normal overpressure design commitment. This design change varies from the response received in RAI 89, Supplement 1, Question 06.04-3

a. Please provide reference to the staff request for additional information that prompted this change to Tier 2 9.4.1.1 of the FSAR revision 2.

b. Clarify this change with respect to the existing Tier 2 CRACS design commitment described in 6.4.2.2 and 6.4.2.3: "The ventilation system maintains a positive pressure of 0.125 inches water gauge as a minimum within the CRE areas with respect to adjacent environmental zones to prevent uncontrolled, unfiltered in-leakage during normal and accident conditions."

c. Please clarify how the test to verify this very low positive pressure would be performed such that a determination can be made of the adequacy of the design.

d. Revise Tier 1 and Tier 2 information as necessary.

Response to Question 06.04-6:

a. A calculation has been completed to change the control room envelope (CRE) overpressure acceptance criterion during normal plant operation from $\geq$ 0.125 inches water gauge to slightly above ambient pressure. Since a safety-related function is not required to be performed during this mode of operation, only a slight positive pressure is required during normal plant operation. The CRE is maintained at a pressure that is slightly above ambient pressure during normal operation to minimize the infiltration of normal airborne particulates and maintain cleanliness.

b. To prevent uncontrolled and unfiltered in-leakage during accident conditions, the CRACS maintains a positive pressure of $\geq$ 0.125 inches water gauge within the CRE areas with respect to adjacent environmental zones. During normal plant operation, the CRACS maintains the areas at ambient pressure.

   The CRACS design commitments described in U.S. EPR FSAR Tier 2, Sections 6.4.2.2 and 6.4.2.3 will be revised to include this information.

c. A test that verifies this pressure is slightly above ambient pressure is not considered to be part of ITAAC. Applicable start up tests and air flow balances will be performed per ASME AG-1 to validate that the supply air flow is balanced with the exhaust air flow for normal plant operation to demonstrate that the CRE pressure is slightly above ambient pressure.

   U.S. EPR FSAR Tier 2, Table 14.3-2—Radiological Analysis (Safety-Significant Features) will be revised to include information contained in this response.

d. U.S. EPR FSAR Tier 1, Table 2.6.1-3—Main Control Room Air Conditioning System ITAAC was revised in the response to RAI 277, Supplement 18, Question 09.04.01-1.

   U.S. EPR FSAR Tier 2, Sections 6.4.2.2 and 6.4.2.3 and Table 14.3-2 will be revised as part of this response.

FSAR Impact:

U.S. EPR FSAR Tier 2, Sections 6.4.2.2 and 6.4.2.3 and Table 14.3-2 will be revised as described in the response and indicated on the enclosed markup.

Question 06.04-7:

Because toxic gas is site-specific, hardware associated with detection, measurement, and isolation are usually designated the responsibility of the COL and based on the specific toxic gas threat. The EPR design chooses to include some of the design information in the FSAR. Although this approach is not prohibited, addressing all possible toxic gas threat in the FSAR can be a challenge. In Tier 2 Section 6.4.2.4, the revised CRE design was changed to prescribe manual as opposed to automatic isolation of the CRE upon detection of toxic gas. If you choose to address toxic gas in the standard design FSAR, clarification of the following information in the FSAR is needed to make a regulatory finding.

a. Please clarify if or how the standard design, as described in FSAR Revision 2, conforms to RG 6.4 guidance for a “Type iii” (SRP 6.4 Section III.3.E.iii) system. Add a paragraph to FSAR section 6.4 that details this conformance in FSAR section 6.4. Also See #7 below.

b. Note that RG 1.78 Section 4.2 says the following with respect to a MCR isolation system:

   “Upon detection of a toxic chemical, a detector should initiate complete closure of isolation dampers to the control room with minimal delay. The isolation time is a function of the control room design, in particular, the inleakage characteristics. If the detectors are upstream from the isolation dampers, credit will be allowed for the travel time between the detectors and the dampers.”

   Please clarify the inconsistency between this RG 1.78 guidance and the design of the CRE as described in FSAR Revision 2.

c. Clarify this change with respect to Tier 1 Table 2.6.1-3 Main Control Room ITAAC number 6.3 which tests automatic isolation of the CRE upon detection of toxic gas from a toxic gas sensor.

d. Clarify this FSAR change with respect to the description of the response of the CRE to an external or internal smoke event as described in FSAR section 9.5.1.2.1

e. Clarify this FSAR change with respect to FSAR Tier 2 Section 14.2 (test abstract #082), Section 3.4.2

f. Clarify this FSAR change with respect to FSAR Tier 2 Chapter 16. B 3.7.10, which state that a toxic gas signal switches CREF to an isolation alignment.

g. FSAR section 6.4 does not define or discuss zone isolation as covered in SRP 6.4 Section III.3.E.i, ii, iii, and iv. Provide a discussion in FSAR section 6.4 on how the EPR CRE addresses this guidance as it relates to the ventilation system types iii and iv and the method of operation for radiological and toxic gas events.

Response to Question 06.04-7:

Parts a thru g

The U.S. EPR FSAR has been revised to reflect that a toxic gas event is a site-specific event. The equipment used for the detection, measurement and isolation associated with a toxic gas release are the responsibility of the COL applicant. The specific toxic gas design, which is currently part of the design of the control room air conditioning system (CRACS) in the U.S. EPR standard design, has been removed from the CRACS, and applicable U.S. EPR FSAR Tier 1 and Tier 2 sections will be revised to reflect this change.

The following existing COL information item 6.4-1 will be deleted:

> “A COL applicant that references the U.S. EPR design certification will identify the type(s) of Seismic Category I Class IE toxic gas sensors (i.e., the toxic chemical(s) of concern) necessary for control room operator protection.”

U.S. EPR FSAR Tier 2, Table 1.8-2—U.S. EPR Combined License Information Items and Section 6.4.6 will be revised to reflect the deletion of this COL information item.

The following existing COL information item 6.4-3 will be revised to state:

> “A COL applicant that references the U.S. EPR design certification will evaluate the results of the toxic chemical accidents from Section 2.2.3, address their impact on control room habitability in accordance with RG 1.78, and if necessary, identify the types of sensors and automatic control functions required for control room operator protection.”

U.S. EPR FSAR Tier 2, Table 1.8-2 and Sections 6.4.1 and 6.4.3 will be revised to reflect the revision of this COL information item.

The following U.S. EPR FSAR Tier 1 sections will be revised to reflect the removal of the toxic gas design from the U.S. EPR standard CRACS design:

- Section 2.6.1.
- Table 2.6.1-1—Main Control Room Air Conditioning System Equipment Mechanical Design.
- Table 2.6.1-3—Main Control Room Air Conditioning System ITAAC.

The following U.S. EPR FSAR Tier 2 sections will be revised to reflect the removal of the toxic gas design from the U.S. EPR standard CRACS design:

- Sections 6.4, 6.4.1, 6.4.2, 6.4.3, 6.4.4, 6.4.6, 9.4.1, 9.4.1.1, 9.4.1.2, 9.5.1.2.1 and 14.2.12.8.10.
- Chapter 16, Technical Specifications 3.6.6, 3.6.7, 3.7.10, 3.7.11 and 3.7.12 and Associated Bases.
- Table 1.8-2—U.S. EPR Combined License Information Items.
- Table 3.2.2-1—Classification Summary.
- Table 3.11-1—List of Environmentally Qualified Electrical/I&C Equipment.
- Figure 9.4.1-1—Control Room Air Intake and CREF (Iodine Filtration) Train Subsystem).

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.6.1 and Tables 2.6.1-1 and 2.6.1-3 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR Tier 2, Sections 6.4, 6.4.1, 6.4.2, 6.4.3, 6.4.4, 6.4.6, 9.4.1, 9.4.1.1, 9.4.1.2, 9.5.1.2.1, 14.2.12.8.10, and Chapter 16, Technical Specifications 3.6.6, 3.6.7, 3.7.10, 3.7.11 and 3.7.12 and Associated Bases; Tables 1.8-2, 3.2.2-1 and 3.11-1; and Figure 9.4.1-1 will be revised as described in the response and indicated on the enclosed markup.

Question 06.04-8:

In Tier 2 Section 6.4.2.3, “Leak-tightness”, the following sentence is unclear “The CRE boundary limits leakage from adjacent environmental zones to a maximum of 50 cfm unfiltered-inleakage.”

RG 1.197, "Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors," Regulatory Position 2.5, states that any analysis to demonstrate compliance with GDC 19 should include a value for inleakage that is due to ingress to and egress from the control room envelope, which is combined with the inleakage test value. Consequently, the ASTM E-741 test acceptance criteria for CRE unfiltered inleakage should be a that assumed in the accident dose analysis minus an amount allocated for access and ingress to the CRE.

a. The FSAR in Section 6.4 should clearly state either: 1) The CRE design limit for boundary inleakage, or 2) The CRE unfiltered inleakage ASTM E-741 test acceptance criteria. Clarify the referenced sentence in Section 6.4.2.3 to state the actual CRE envelope leak tightness test acceptance criteria value: This value should be 40 cfm plus 10 cfm allocated for CRE ingress and egress, which would correspond to FSAR Table 15.0-18; which states that the pre and post isolation unfiltered inleakage from areas surrounding the MCR pressure envelope, including ingress and egress is 50 cfm total. The corresponding note in that table states that 10 cfm allocation for CRE access and ingress is incorporated in the 50 cfm total value. Alternatively, revise the sentence to state the CRE design limit for boundary inleakage. This value should be 40 cfm.

b. This last paragraph in FSAR section 6.4.2.3 also states that CRE testing requirements will be specified in the control room envelope habitability program in Technical Specification Section 5.5.17. If the applicant intends to propose an ingress egress allocation for unfiltered CRE inleakage that is less than the 10 cfm value stated in the guidance, this FSAR section should be revised to state what that value is. In addition supporting justifying design information would need to be included in 6.4.2.3 of the FSAR to support staff review of lower access/ingress leakage allocation values. The current CRE design information in the FSAR is insufficient to support values less than 10 cfm. For example the staff noted that two door vestibules are provided in some but not all of the CRE access points. (see figure 6.4-2) In addition more design information on vestibule door seals, expected vestibule pressures, and necessary features to enable doors to interlock to function as air locks would need to be provided. Additionally, if a smaller value than 10 cfm is assumed for CRE ingress/egress and justified, conforming changes should be noted in the DBA dose calculations described in FSAR Chapter 15.0.3.

c. Clarify Tier 1 Table 2.6.1-3 Main Control Room Air Conditioning System ITAAC item 6.4 Acceptance Criteria to state that the Test confirms that the unfiltered air in-leakage inside the CRE area boundary is less than or equal to 40 cfm total. Alternatively, clarify this to state that the Test confirms that the unfiltered air in-leakage inside CRE area boundary is less than or equal to 50 cfm total, which includes10 cfm allocated for unfiltered in-leakage due to CRE access/egress.

Response to Question 06.04-8:

a. U.S. EPR FSAR Tier 2, Section 6.4.2.3 will be revised to include a clarification that 40 cfm is unfiltered boundary in-leakage and 10 cfm is considered for CRE ingress and egress, which is in accordance with test acceptance criteria given in RG 1.197. U.S. EPR FSAR Tier 2, Section 6.4.7 will also be revised to include a new reference.

b. U.S. EPR FSAR Tier 2, Table 14.3-2—Radiological Analysis (Safety-Significant Features) will be revised to include a clarification of Item 2-8, which states that the 50 cfm of MCR ventilation unfiltered air inleakage includes 40 cfm boundary leakage plus 10 cfm ingress and egress leakage.

c. U.S. EPR FSAR Tier 1, Table 2.6.1-3—Main Control Room Air Conditioning System ITAAC will be revised to indicate that only the unfiltered air in-leakage inside the CRE area boundary of 40 cfm is considered an ITAAC. The 10 cfm for ingress and egress leakage is an analytical value and is not field tested.

FSAR Impact:

U.S. EPR FSAR Tier 1, Table 2.6.1-3 and Tier 2, Sections 6.4.2.3 and 6.4.7, and Table 14.3-2 will be revised as described in the response and indicated on the enclosed markup.

Question 06.05.01-2:

Follow-up to RAI 233, Question 06.05.01-1

In RAI 233 Question 06.05.01-1, the staff requested additional information on the design, inspection and testing of the EPR ESF filter systems in order for the staff to determine if the US EPR design complies with the guidance of Regulatory Guide 1.52. The staff is using the guidance of NUREG-0800 Section 6.5.1 in order to perform this review and determine the necessary detail of design information to be reviewed. The previous RAI requested specific design information along with any supporting justifying information.

The staff has reviewed the RAI response (The July 10, 2009 and the September 1, 2009, response to RAI 233, Question 06.05.01-1, Supplement 1) and the following information is requested:

The staff considers this information design-basis information that that must be incorporated into the FSAR Tier 2 because this information will be used to justify staff determinations on the adequacy of the EPR ESF filter system design. Therefore:

a. Incorporate your response to Question 06.05.01-1 parts 1 through 5 in the Carbon Adsorber Section of the FSAR. Section 6.5.1.2.2
b. Incorporate your response to Question 06.05.01-1 (Additional Information Question) in the HEPA Filter Section of the FSAR Section 6.5.1.2.2.

Response to Question 06.05.01-2:

<u>Parts a and b</u>

U.S. EPR FSAR Tier 2, Section 6.5.1.2.2 will be revised to incorporate the response to RAI 233, Question 06.05.01-1, Parts 1 through 5, and the response to RAI 233, Question 06.05.01-1 (Additional Information Question). U.S. EPR FSAR Tier 2, Section 6.5.4 will also be revised to include a new reference.

FSAR Impact:

U.S. EPR FSAR Tier 2, Sections 6.5.1.2.2 and 6.5.4 will be revised as described in the response and indicated on the enclosed markup.

Question 06.05.01-3:

Follow-up to RAI 135, Question 09.04.05-1.13

The February 27, 2009, response to RAI 135, Question 09.04.05-1.13, addressed moisture removal for the SBVS during other operational events. The staff requested the applicant clarify the ESF filter system design as it relates to RG 1.52 position C.3; paragraph C3.1, which recommends installation of a moisture separator prior to the heater to remove entrained water droplets from the inlet air stream, thereby protecting downstream HEPA filters and iodine absorbers. In a February 27, 2009, response to RAI 135, Question 09.04.05-1.13, you clarified the FSAR to include a description of the moisture separator in the design of the ESF filter systems. You clarified that the SBVS Iodine Filtration Trains incorporate Moisture Separators in the Prefilter design, and the applicant clarified that the SBVS moisture separator meets the requirements of RG 1.52, ASME N509 and ASME AG-1.

a. The staff notes that the response and the FSAR revisions seem specific to the design of the SBVS ESF filter train. The RAI on compliance with guidance on the incorporation of a moisture separator in a ESF filter system design is general. Please clarify the FSAR description of the moisture separator for the other systems that contain ESF filtration systems (AVS, CRACS and Containment Building Low Flow Purge Exhaust filtration trains). Revise FSAR drawings and descriptions of these systems as required, to clearly show an ESF filter system moisture separator and associated drain, or justify taking exception to RG 1.52 position C.3; paragraph C3.1 guidance.

b. NUREG-0800 Section 6.5.1 contains specific guidance on demister water drain design. Section IIIG of this guidance states the following: “Water drain design and the accessibility of components and ease of maintenance are in accordance with the recommendations of ERDA 76-21 and ASME N509-1989. In addition RG 1.52 regulatory position C4.8 specifies ERDA 76-21 and Section HA of ASME AG-1a2000. Revise the FSAR description of the moisture separator to specifically address compliance with ERDA 76-21 “Nuclear Air Cleaning Handbook”, and Section HA of ASME AG-1a2000 as these references apply to Moisture Separator water drain design, accessibility of components and ease of maintenance.

c. The discussion in FSAR Section 12 on ventilation system design features which demonstrate compliance with requirements of 10 CFR 20.1406 is related to the design of the ESF filter system moisture separator drains. The discussion on HVAC air handling equipment drainage is general in nature. Revise this section of the FSAR to clarify that drains from ESF moisture separators are routed to a drain system that will handle potentially contaminated liquid. Revise the paragraph as needed to address the above design provisions to ensure that any drainage is properly collected.

Response to Question 06.05.01-3:

<u>Part a</u>

The design of U.S. EPR engineered safety features (ESF) filter trains has been revised to be consistent with the guidance and criteria given in RG 1.52, Regulatory Position C3.1. The corresponding U.S. EPR FSAR Tier 1 and Tier 2 changes were provided in the response to RAI 277, Supplement 18, Question 09.04.03-3.

Parts b and c

U.S. EPR FSAR Tier 2, Section 12.3.3.3 will be revised to reflect that drains from the ESF filter system moisture separators are routed to the NIDVS that handles potentially contaminated liquids. U.S. EPR FSAR Tier 2, Section 6.5.1.2.2 will also be revised to provide a clarification related to the HEPA filters.

FSAR Impact:

U.S. EPR FSAR Tier 2, Sections 6.5.1.2.2 and 12.3.3.3 will be revised as described in the response and indicated on the enclosed markup.

Question 06.05.01-4:

FSAR Revision 2, Tier 2, Section 6.5.2.5 “Instrumentation Requirements” State that instrumentation and controls related to the ESF filters are described with the associated ventilation systems in the corresponding sections of the FSAR. It specifically states that Instrumentation and controls for ESF Filter Systems are provided in Table 9.4.1-1- Minimum Instrumentation, Indication and Alarm Features for CREF (Iodine Filtration) Train Subsystem ESF Filter Systems” The staff has reviewed this information and requests the following information:

a. The above cited information is unclear. As shown in revision 2 of the FSAR The title of Table 9.4.1-1 is “Minimum Instrumentation, Indication and Alarm Features from CREF (Iodine Filtration)Train Subsystem” The referenced table (Table 9.4.1-1) is specific to the CREF (iodine Filtration) Train subsystem. However there are three other ESF filter systems that is covered in FSAR section 6.5.1 (AVS Accident filtration Trains, SBVS Accident Iodine Exhaust filtration trains, and Containment building ventilation system: Low-Flow Purge Exhaust subsystem). Contrary to the information in this paragraph, there is no information or table showing the minimum inventory of alarms displays and controls for the ESF filter system portion of the AVS, SBVS or CBVS in the respective FSAR sections. Therefore it is unclear what instrumentation, is supplied for these systems. Revise this paragraph to clarify this. Revise the “Instrument Requirements” paragraphs in the respective FSAR sections to clearly indicate the minimum inventory of alarms displays and controls such that instrument requirements for all ESF filter systems are clearly addressed., such list should address NUREG-0800 guidance for ESF filter systems as addressed below:

b. NUREG-0800 Section 6.5.1 contains specific guidance on what should be the minimum inventory of alarms, displays and controls for ESF filter systems. Section IIID of this guidance states the following: “ Design of instrumentation for ESF atmosphere cleanup systems conforms to the guidelines of RG 1.52 and to the recommendations of ASME N509-1989. Instrumentation, readout, recording, and alarm provisions for ESF atmosphere cleanup systems meet the minimum guidance given in Table 6.5.1-1 of this SRP section”

c. For each respective ESF filter system, address Table 6.5.1-1.

d. For each respective ESF filter system, revise the FSAR to clearly specify design requirements for instrumentation for ESF filter systems as it relates to this guidance.

e. Include a table of the Minimum instrumentation, readout, recording and alarm provisions for the ESF filter system.

f. Revise Tier 1 ITAAC tables to list the minimum inventory of alarms, displays and controls for ESF filter system instrumentation associated with the SBVS, AVS and the CBVS.

Response to Question 06.05.01-4:

<u>Parts a through e</u>

U.S. EPR FSAR Tier 1, Table 2.6.1-2—Main Control Room Air Conditioning System Equipment I&C and Electrical Design, Table 2.6.3-2—Annulus Ventilation System Equipment I&C and Electrical Design, Table 2.6.6-2—Safeguard Building Controlled-Area Ventilation System

Equipment I&C and Electrical Design and Table 2.6.8-3—Containment Building Ventilation System Equipment I&C and Electrical Design will be revised to include additional instrumentation and controls information for the applicable ESF filter systems.

A new U.S. EPR FSAR Tier 2, Table 6.2.3-3—Minimum Instrumentation, Indication and Alarm Features for AVS (Accident Filtration Trains) will be created to provide instrumentation and controls information for the AVS equipment. U.S. EPR FSAR Tier 2, Sections 6.2.3.5 and 6.2.3.6 will also be revised to support the introduction of this new table.

U.S. EPR FSAR Tier 2, Table 9.4.1-1—Minimum Instrumentation, Indication and Alarm Features for CREF (Iodine Filtration) Train Subsystem will be revised to provide updated instrumentation and controls information for the CREF equipment. U.S. EPR FSAR Tier 2, Sections 6.5.1.5 and 9.4.1.5 will also be revised to support the revision of this table.

A new U.S. EPR FSAR Tier 2, Table 9.4.5-1—Minimum Instrumentation, Indication and Alarm Features for SBVS (Accident Iodine Exhaust Filtration Trains) will be created to provide instrumentation and controls information for the SBVS equipment. U.S. EPR FSAR Tier 2, Section 9.4.5.5 will also be revised to support the introduction of this new table.

A new U.S. EPR FSAR Tier 2, Table 9.4.7-1—Minimum Instrumentation, Indication and Alarm Features for CBVS (Low-Flow Purge Exhaust Subsystem) will be created to provide instrumentation and controls information for the CBVS equipment. U.S. EPR FSAR Tier 2, Section 9.4.7.5 will also be revised to support the introduction of this new table.

Part f

The development of U.S. EPR FSAR Tier 1 information is based on Standard Review Plan (SRP) 14.3, which states that not all information required for compliance with regulations and described in Tier 2 is required to be in Tier 1 and have ITAAC. SRP 14.3 describes a graded approach to selecting information from Tier 2 and including that information in Tier 1 with ITAAC. SRP 14.3 specifies non-safety-related criteria for inclusion in Tier 1 such as severe accident, anticipated transient without scram (ATWS) and fire protection.

U.S. EPR FSAR Tier 2 material is screened to determine if it is “safety significant” as described in U.S. EPR FSAR Tier 2, Section 14.3. This screening process uses criteria developed from SRP 14.3, Appendices A and C. The first process uses discipline checklists that include ITAAC criteria based on guidance in SRP, Section 14.3. For example, the discipline checklist for systems provides guidance to create ITAAC for the following features:

- Major safety-related features.
- Equipment that is seismic, EQ or 1E.
- Safety-related equipment.
- Design features provided for severe accident mitigation, SBO and ATWS.
- Significant system features identified in the applicable SRPs for the system.

- Significant safety-related (and non-safety-related) functions derived from those listed in system design requirements documents.

The second process involves an expert review panel that selects safety-significant features based on assumptions and insights from key safety and integrated plant safety analyses in U.S. EPR FSAR Tier 2, where plant performance is dependent on contributions from multiple systems. This process is based on guidance in SRP 14.3, Page 14.3-21. Results of expert review panel meetings are provided in U.S. EPR FSAR Tier 2, Tables 14.3-1 through 14.3-7.

Specifically:

SRP 14.3, Appendix A, Page 14.3-16 states:

“The applicant should put the top-level design features and performance characteristics that were the most significant to safety in the Tier 1 design descriptions. The level of detail in Tier 1 is governed by a graded approach to the SSCs of the design, based on the safety significance of the functions they perform.”

“For example, safety-related SSCs should be described in Tier 1 with a relatively greater amount of information. Other SSCs should also be included based on their importance to safety, such as containment isolation aspects of non-safety systems. Some non-safety aspects of SSCs need not be discussed in Tier 1. This graded approach recognizes that although many aspects of the design are important to safety, the level of design detail in Tier 1 and verification of the key design features and performance characteristics should be commensurate with the significance of the safety functions to be performed.”

SRP 14.3, Page 14.3-17 states:

“The level of detail specified in the ITAAC should be commensurate with the safety significance of the functions and bases for that SSC.”

SRP 14.3, Appendix A, Page 14.3-21 states:

“The staff is particularly interested in ensuring that the assumptions and insights from key safety and integrated plant safety analyses in Tier 2, where plant performance is dependent on contributions from multiple systems of the design, are adequately considered in Tier 1. Addressing these assumptions and insights in Tier 1 ensures that the integrity of the fundamental analyses for the design are preserved in an as-built facility referencing the certified design. These analyses include flooding analyses, over-pressure protection, containment analyses, core cooling analyses, fire protection, transient analyses, anticipated transient without scram analyses, steam generator tube rupture analyses (PWRs only), radiological analyses, USIs/GSIs and TMI items, or other key analyses as specified by the staff. Therefore, applicants should provide information, in tabular form, in Section 14.3 that cross references the important design information and parameters of these analyses to their treatment in Tier 1. The cross-references should be sufficiently detailed to allow a COL applicant or licensee to consider whether a proposed design change impacts the treatment of these parameters in Tier 1.”

SRP 14.3, Appendix A, Page 14.3-17 states:

“Also, the scope of the ITAAC is consistent with the SSCs that are in the design descriptions. In general, each system has one or more ITAAC that verify the information in the design descriptions. The system ITAAC should verify that the key design characteristics and performance requirements of the SSCs are verified. The level of detail specified in the ITAAC should be commensurate with the safety significance of the functions and bases for that SSC.”

SRP14.3, Appendix C, Page 14.3-24 states:

“This section is not repeated here, but it provides a discussion of what should be included as a ‘key feature,’ and therefore, by exclusion, what does not have to be addressed in Tier 1 and hence ITAAC.”

The inventory of alarms and controls for ESF filter system instrumentation associated with the CRACS, SBVS, AVS and CBVS are not “safety significant.”

The lack of inclusion in U.S. EPR FSAR Tier 1 does not mean that the COL applicant does not have to address the items described in U.S. EPR FSAR Tier 2. The COL applicant must comply with U.S. EPR FSAR Tier 2 or take an exception to it. Further evidence of this is provided in the inspection manual chapters that have separate chapters on ITAAC (IMC 2503) inspections and non-ITAAC (2504) inspections.

FSAR Impact:

U.S. EPR FSAR Tier 1, Table 2.6.1-2, Table 2.6.3-2, Table 2.6.6-2 and Table 2.6.8-3 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR Tier 2, Sections 6.2.3.5, 6.2.3.6, 6.5.1.5, 9.4.1.5, 9.4.5.5 and 9.4.7.5; and Table 9.4.1-1 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR Tier 2, Table 6.2.3-3, Table 9.4.5-1 and Table 9.4.7-1 will be created as described in the response and indicated on the enclosed markup.

Question 06.05.01-5:

Follow-up to RAI 312, Question 09.04.02-3

In RAI 312, Question 09.04.02-3 the staff requested that you justify the use of ASME AG-1-2003, Referenced in FSAR Tier 2 Section 6.5.4, in lieu of ASME AG-1-1997, which is the version of this code endorsed by RG 1.52. The staff also requested you justify the use of ASME N509 (2002), Referenced in FSAR Tier 2 Section 6.5.4 in lieu of ASME N509 (1989), which is the version of this code endorsed by RG 1.52. In an October 21, 2009 response the applicant provided a reconciliation of the two versions of the code as they relate to the US EPR design. The applicant also provided marked up correction to FSAR Tier 2 Table 1.9.-2, which notes that The EPR standard design takes exception to RG 1.52 and 1.140 as noted above.

Based on a review of your response and proposed FSAR corrections the following information is requested.

1. Significantly more information is needed in order to justify the use of the newer version of the above codes for the US EPR design. The proposed revisions to the FSAR that describe the departure leaves it unclear what regulatory positions of RG 1.52 are being departed from. In order to review and document this deviation from guidance for the EPR design, this detail must be captured in the FSAR and reviewed. This process is expected to take a significant amount of resources. Therefore the staff recommends that you cite the previously approved versions of these codes, and do not depart from guidance of Regulatory Guide 1.52.

2. Alternatively, provide more specific justification for compliance and departure from RG 1.52 in the FSAR. This justification should address each paragraph of RG 1.52 with a separate discussion on why the later version of ASME N509 or ASME AG-1 guidance is equivalent or improved over that cited in each individual paragraph of the RG as specified below.

    a. Include this discussion in FSAR as noted below. The discussion should be, clearly linked to RG 1.52 for the respective regulatory position as noted below. Compliance with applicable guidance should be discussed in the existing FSAR paragraphs specifically for the following system Environmental design criteria in the following area:

        i. Regulatory Position C2.2: Describe how this position is addressed, specifically the need for shielding for nearby equipment In paragraph 6.5.1.2.1, or the respective HVAC sections of the FSAR

    b. Include this discussion in FSAR as noted below. The discussion should be clearly linked to RG 1.52 for the respective regulatory position as noted below. Compliance with applicable guidance should be discussed in the existing FSAR paragraphs specifically for the following system design criteria in the following areas:

        i. Regulatory Position C3.1: The staff notes that a moisture separator is still not mentioned in FSAR paragraph 6.5.1.2.1. Include this component in the description of the General System Design of EPR ESF filter systems, or justify why a moisture separator is not supplied for some ESF trains (see related RAI)

ii. C3.2: Specify if this position is or is not met for the SBVS: Accident Iodine Exhaust filtration trains and the Containment Building low flow purge exhaust subsystem. In paragraph 6.5.1.2.1, or the respective HVAC sections of the FSAR.

iii. C3.3: Specify/justify if this position applies to any ESF filter system in paragraph 6.5.1.2.1 of the FSAR.

iv. C3.6: Include the information you previously provided the staff in your response to RAI 6.5.1-1. (See related RAI)

v. C3.7: Include information on supplied ESF filter system instrumentation as described in the related RAI on ESF instrumentation.

vi. C3.10 Specify and discuss ESF filter system design features that address this regulatory position in paragraph 6.5.1.2.1 of the FSAR

c. Include this discussion in FSAR section 6.5.1 under the appropriate section. A discussion should be added, clearly linked to RG 1.52 for the respective regulatory position (noted below). Compliance with applicable guidance should be discussed in the existing FSAR paragraphs specifically for the following components:

i. Moisture separator (Regulatory position 4.1)

ii. Filter Air heaters (4.2)

iii. Prefilters (4.3)

iv. HEPA filters (4.4)

v. Dampers (4.13)

vi. System fan, fan mounting and ductwork connection (4.14)

vii. Carbon Adsorbers (Design, Construction and Testing 4.10; see related RAI on details of Carbon Adsorber design to be included in FSAR)

d. The staff notes that additional sections on other ESF filter system components should be added for a clear discussion, clearly linked to RG 1.52 for the respective regulatory position (noted below). Compliance or departure from RG 1.52 guidance should be discussed with new sections or paragraphs specifically for the following components:

i. Mounting frames for the HEPA filter and Type II adsorber cells (Regulatory position C4.5)

ii. Filter and adsorber Bank Arrangement (4.6)

iii. System filter housings including floors and doors (4.7)

iv. Water drains (4.8; see related RAI on Moisture Separator Water drains)

v. Ducts and filter housings (4.12)

e. Specifically address departures and compliance from Maintainability Criteria as described in RG 1.52 in the FSAR. Compliance with applicable guidance should be discussed with new sections or paragraphs specifically in the following areas:

i. Accessibility of components for maintenance (Regulatory position C5.1)

ii. Removal of cleanup components (5.2)

Response to Question 06.05.01-5:

Parts 1 and 2

Applicable portions of the U.S. EPR systems design have been revised and will utilize ASME AG-1-1997, including AG-1a-2000 Addenda "Housings" and ASME N509 (1989) as endorsed by RG 1.52, Rev. 3.

The corresponding U.S. EPR FSAR Tier 1 and Tier 2 changes were provided in the response to RAI 277, Supplement 18, Question 09.04.03-3.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

U.S. EPR Final Safety Analysis Report Markups

2.6 HVAC Systems

2.6.1 Main Control Room Air Conditioning System

1.0 Description

The main control room air conditioning system (CRACS) supplies air to the control room envelope (CRE) area which includes the main control room (MCR) and associated rooms.

The CRACS controls the CRE area temperature and air change rate for personnel comfort, personnel safety, and equipment protection during normal plant operation. The CRACS provides cooling, heating, and ventilation for the CRE area to remove equipment heat, and heat generated from other sources. The CRACS also provides heat to maintain a minimum temperature in the CRE area. The CRACS provides a minimal air change rate for the CRE area and controls building pressurization to reduce spreading of contamination.

The CRACS maintains habitability of the CRE areas in case of radioactive or toxic gas contamination of the environment. The CRACS also maintains a positive pressure in the CRE area to prevent infiltration of contaminated outside air. The CRACS operates in recirculation mode with fresh air makeup.

The CRACS provides the following safety-related functions:

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- Maintains ambient temperature conditions inside the CRE area during design basis conditions, including a radiological contamination event, or toxic gas contamination of the environment.
- Provides carbon filtration of outside air and recirculated air from within the CRE area.
- Maintains a positive pressure in the CRE area relative to the adjacent areas to prevent unfiltered in-leakage, . upon receipt of a containment isolation signal (CIS) or high radiation alarm signal in the air intake ducts.

2.0 Arrangement

2.1 The functional arrangement of the CRACS is as shown on the following figures:

- Figure 2.6.1-1—Control Room Air Intake and CREF (Iodine Filtration) Train Subsystem Functional Arrangement.
- Figure 2.6.1-2—Control Room Air Conditioning and Recirculation Air Handling Subsystem Functional Arrangement.
- Figure 2.6.1-3—CRE Air Supply and Recirculation Subsystem Functional Arrangement.

flowrate is established from the CRE area to the iodine filtration train, and a positive pressure is maintained in the CRE area relative to the adjacent areas.

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6.3 Deleted.Upon actuation of the plant toxic gas alarm signal, the outside air intake dampers close automatically and the CRE area air is directed in recirculation mode without outside air.

6.4 The CRE area ventilation unfiltered air in-leakage is minimized in order to maintain the MCR habitability.

6.5 Each CRACS train has the capability to remove the design heat loadThe CRACS provides cooling and heating to maintain the design temperatures in the CRE area, while operating in a design basis accident alignment.

6.6 The CREF heaters protect the carbon adsorber from high humidity during operation of the CREF unit.

6.7 Upon receipt of a high radiation alarm signal in the air intake ducts, the iodine filtration train will start automatically, the outside air supply to the CRE area is diverted through the iodine filtration train, a minimum CRE recirculation flowrate is established from the CRE area to the iodine filtration train, and a positive pressure is maintained in the CRE area relative to the adjacent areas.

7.0 Inspections, Tests, Analyses and Acceptance Criteria

Table 2.6.1-3 lists the CRACS ITAAC.

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Table 2.6.1-1—Main Control Room Air Conditioning System Equipment Mechanical Design (5 Sheets)

Description	Tag Number (1)	Location	ASME AG-1 Code	Function	Seismic Category
Fresh Air Intake Trains 30SAB01 and 30SAB04					
Motor Operated Dampers	30SAB01AA002 30SAB04AA002 30SAB11AA001 30SAB11AA003 30SAB11AA004 30SAB14AA001 30SAB14AA003 30SAB14AA004	Safeguard Building 2 Safeguard Building 3	Yes	Open / Close (“Open for high radiation alarm signal, and “Close” for toxic gas signal)	I
Electric Heaters	30SAB01AH001 30SAB04AH001	Safeguard Building 2 Safeguard Building 3	Yes	On / Off (based on ambient conditions)	I
Motor Operated Dampers	30SAB01AA003 30SAB04AA003 30SAB01AA004 30SAB04AA004	Safeguard Building 2 Safeguard Building 3	Yes	Close	I
Prefilters	30SAB01AT001 30SAB04AT001	Safeguard Building 2 Safeguard Building 3	Yes	N/A	I
Manual Dampers	30SAB01AA006 30SAB04AA006	Safeguard Building 2 Safeguard Building 3	Yes	N/A	I
Motor Operated Dampers	30SAB01AA012 30SAB04AA012	Safeguard Building 2 Safeguard Building 3	Yes	Open	I

Table 2.6.1-2—Main Control Room Air Conditioning System Equipment I&C and Electrical Design (5 Sheets)

06.05.01-4

Description	Tag Number (1)	Location	IEEE Class 1E (2)		PACS	MCR / RSS Displays	MCR / RSS Controls
Motor Operated Damper	30SAB45AA004	Safeguard Building 2	Division 4N Division 3A		Yes	Position / Position	Open-Close / Open-Close
MCR Air Exhaust 30SAB42							
Motor Operated Damper	30SAB42AA001	Safeguard Building 2	Division 1N Division 2A		Yes	Position / Position	Open-Close / Open-Close
Motor Operated Damper	30SAB42AA002	Safeguard Building 2	Division 4N Division 3A		Yes	Position / Position	Open-Close / Open-Close
~~Pressure Sensors~~Instruments							
Differential Pressure across 30SAB11 Iodine Train Filters	30SAB11CP001	Safeguard Building 2	N/A		N/A	Press / Press	N/A
Differential Pressure across 30SAB14 Iodine Train Filters	30SAB14CP001	Safeguard Building 3	N/A		N/A	Press / Press	N/A
Differential Pressure between Main Control Room and ~~reference~~ Adjacent Rooms	30SAB32CP001 30SAB32CP002 30SAB32CP003	Safeguard Building 2	N/A		N/A	Press / Press	N/A
Iodine Filtration Train Flow	30SAB11CF001 30SAB14CF001	Safeguard Building 2 Safeguard Building 3	N/A		N/A	Flow / Flow	N/A
~~Temperature Sensors~~							

Table 2.6.1-2—Main Control Room Air Conditioning System Equipment I&C and Electrical Design (5 Sheets)

06.05.01-4

Description	Tag Number (1)	Location	IEEE Class 1E (2)		PACS	MCR / RSS Displays	MCR / RSS Controls
Outside Air temperature sensors for trains 30SAB01/04	30SAB01CT001 30SAB04CT001	Safeguard Building 2 Safeguard Building 3	N/A		N/A	Temp / Temp	N/A
Protective Switch-off Temperature for Electric Heaters	30SAB01CT002 30SAB04CT002	Safeguard Building 2 Safeguard Building 3	N/A		N/A	Temp / Temp	N/A
Temperature Downstream of Electric Heaters	30SAB01CT003/004 30SAB04CT003/004	Safeguard Building 2 Safeguard Building 3	N/A		N/A	Temp / Temp	N/A
Main Control Room Temperature	30SAB32CT002 30SAB32CT003	Safeguard Building 2	N/A		N/A	Temp / Temp	N/A
Temperature Downstream of Iodine Train Heaters	30SAB11CT002 30SAB14CT002	Safeguard Building 2 Safeguard Building 3	N/A		N/A	Temp / Temp	N/A
Temperature Upstream of Iodine Train Heaters	30SAB11CT003 30SAB14CT003	Safeguard Building 2 Safeguard Building 3	N/A		N/A	Temp / Temp	N/A

1) Equipment tag numbers are provided for information only and are not part of the certified design.

2) ^{N} denotes division the component is normally powered from, while ^{A} denotes division the component is powered from when alternate feed is implemented.

Table 2.6.1-3—Main Control Room Air Conditioning System ITAAC (6 Sheets)

06.04-7

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
6.3	Deleted.~~Upon actuation of the plant toxic gas alarm signal, the outside air intake dampers close automatically and the CRE area air is in recirculation mode without outside air.~~	Deleted.~~A test will be performed to verify that upon actuation of the plant toxic gas alarm test signal, the outside air intake dampers close automatically and the CRE area air is in recirculation mode without outside air. Test is performed separately for each air intake train.~~	Deleted.~~A separate test for each air intake train confirms that upon actuation of the plant toxic gas alarm test signal, the outside air intake dampers close automatically and the CRE area air is in recirculation mode without outside air.~~
6.4	The CRE area ventilation unfiltered air in-leakage is minimized in order to maintain the MCR habitability.	A ~~T~~test will be performed to measure the unfiltered air in-leakage inside the CRE area boundary.	The test confirms that the unfiltered air in-leakage inside the CRE area boundary is less than or equal to ~~50~~ 40 scfm.

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Table 2.6.3-2—Annulus Ventilation System Equipment I&C and Electrical Design (3 Sheets)

06.05.01-4

Exhaust Fan	30KLB24AN001	Fuel Building	Division 4[N] Division 3[A]		Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Electrical Heater	30KLB21AH001	Fuel Building	Division 1[N] Division 2[A]		Yes	Yes	On-Off / On-Off	Start-Stop / Start-Stop
Electrical Heater	30KLB24AH001	Fuel Building	Division 4[N] Division 3[A]		Yes	Yes	On-Off / On-Off	Start-Stop / Start-Stop
Instruments								
Annulus Pressure ~~sensors~~	30KLB21CP001 30KLB24CP001	Fuel Building	N/A		Yes	N/A	Press / Press	N/A
Temperature ~~sensor~~ Upstream of Heaters	30KLB21CT001 30KLB24CT001	Fuel Building	N/A		Yes	N/A	Temp / Temp	N/A
Temperature Limit Switch ~~sensors~~ for Heaters	30KLB21CT002 30KLB24CT002	Fuel Building	N/A		Yes	N/A	Temp / Temp	N/A
Temperature Regulation ~~sensors~~ for Heaters	30KLB21CT003 30KLB24CT003	Fuel Building	N/A		Yes	N/A	Temp / Temp	N/A
Temperature downstream of carbon adsorbers	30KLB21CT004 30KLB24CT004	Fuel Building	N/A		Yes	N/A	Temp / Temp	N/A
Pressure Limit Switch ~~Sensor~~ Exhaust Fans	30KLB21CP002 30KLB24CP002	Fuel Building	N/A		Yes	N/A	Press / Press	N/A
~~Pre-Filter Dp Gauge~~	~~30KLB21CP501 30KLB24CP501~~	~~Fuel Building~~	~~N/A~~		~~Yes~~	~~N/A~~	~~N/A~~	~~N/A~~
~~HEPA Filter Dp Gauge~~	~~30KLB21CP502 30KLB24CP502~~	~~Fuel Building~~	~~N/A~~		~~Yes~~	~~N/A~~	~~N/A~~	~~N/A~~

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Table 2.6.3-2—Annulus Ventilation System Equipment I&C and Electrical Design (3 Sheets)

Iodine Adsorber Dp Gauge	30KLB21CP503 30KLB24CP503	Fuel Building	N/A		Yes	N/A	N/A	N/A
Downstream HEPA Filter Dp Gauge	30KLB21CP504 30KLB24CP504	Fuel Building	N/A		Yes	N/A	N/A	N/A
Accident Filtration Train Differential Pressuredp gauge	30KLB21CP505 30KLB24CP505	Fuel Building	N/A		Yes	N/A	Press / PressN/A	N/A
Accident Filtration Train Flow sensors	30KLB21CF001A 30KLB21CF001B	Fuel Building	N/A		Yes	N/A	Flow / Flow	N/A

1) Equipment tag numbers are provided for information only and are not part of the certified design.

2) ^{N} denotes division the component is normally powered from, while ^{A} denotes the component is powered from when alternate feed is implemented.

Table 2.6.6-2—Safeguard Building Controlled-Area Ventilation System Equipment I&C and Electrical Design (7 Sheets)

06.05.01-4

Description	Tag Number[1]	Location	IEEE Class 1E [2]		EQ – Harsh Env.	PACS	MCR / RSS Displays	MCR / RSS Controls
Recirculation Fans	30KLC52AN001 30KLC52AN002	Safeguard Building 2 Safeguard Building 2	Division 2[N]		Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Recirculation Fans	30KLC53AN001 30KLC53AN002	Safeguard Building 3 Safeguard Building 3	Division 3[N]		Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Recirculation Fans	30KLC54AN001 30KLC54AN002 30KLC54AN003	Safeguard Building 4 Safeguard Building 4 Safeguard Building 4	Division 4[N]		Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Instruments								
Exhaust Air Flow ~~Sensors~~	30KLC45CF001 30KLC45CF002	Fuel Building	N/A		Yes	N/A	Flow / Flow	N/A
Medium Head SIS Pump Room Temperature ~~sensors~~	30KLC51CT001 30KLC51CT002 30KLC52CT001 30KLC52CT002 30KLC53CT001 30KLC53CT002 30KLC54CT001 30KLC54CT002	Safeguard Building 1 Safeguard Building 1 Safeguard Building 2 Safeguard Building 2 Safeguard Building 3 Safeguard Building 3 Safeguard Building 4 Safeguard Building 4	N/A		Yes	N/A	Temp / Temp	N/A

Table 2.6.6-2—Safeguard Building Controlled-Area Ventilation System Equipment I&C and Electrical Design (7 Sheets)

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Description	Tag Number[1]	Location	IEEE Class 1E [2]		EQ – Harsh Env.	PACS	MCR / RSS Displays	MCR / RSS Controls
Low Head SIS Pump Room Temperature ~~sensors~~	30KLC51CT003 30KLC51CT004 30KLC52CT003 30KLC52CT004 30KLC53CT003 30KLC53CT004 30KLC54CT003 30KLC54CT004	Safeguard Building 1 Safeguard Building 1 Safeguard Building 2 Safeguard Building 2 Safeguard Building 3 Safeguard Building 3 Safeguard Building 4 Safeguard Building 4	N/A		Yes	N/A	Temp / Temp	N/A
CCW & EFW Valve Room Temperature ~~sensors~~	30KLC51CT005 30KLC51CT006 30KLC52CT005 30KLC52CT006 30KLC53CT005 30KLC53CT006 30KLC54CT005 30KLC54CT006	Safeguard Building 1 Safeguard Building 1 Safeguard Building 2 Safeguard Building 2 Safeguard Building 3 Safeguard Building 3 Safeguard Building 4 Safeguard Building 4	N/A		Yes	N/A	Temp / Temp	N/A
Sampling System Room Temperature ~~sensors~~	30KLC51CT007 30KLC51CT008 30KLC54CT007 30KLC54CT008	Safeguard Building 1 Safeguard Building 1 Safeguard Building 4 Safeguard Building 4	N/A		Yes	N/A	Temp / Temp	N/A
Temperature Downstream of Iodine Filtration Heater	30KLB41CT001 30KLB42CT001	Fuel Building	N/A		Yes	N/A	Temp / Temp	N/A

Table 2.6.6-2—Safeguard Building Controlled-Area Ventilation System Equipment I&C and Electrical Design (7 Sheets)

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Description	Tag Number(1)	Location	IEEE Class 1E (2)		EQ – Harsh Env.	PACS	MCR / RSS Displays	MCR / RSS Controls
Temperature Downstream of Carbon Adsorbers	30KLB41CT003 30KLB42CT003	Fuel Building	N/A		Yes	N/A	Temp / Temp	N/A
Differential Pressure across Iodine Filtration Trains	30KLB41CP001 30KLB42CP001	Fuel Building	N/A		Yes	N/A	Temp / Temp	N/A

1) Equipment tag numbers are provided for information only and are not part of the certified design

2) ^{N} denotes division the component is normally powered from, while ^{A} denotes division the component is powered from when alternate feed is implemented.

Table 2.6.8-3—Containment Building Ventilation System Equipment I&C and Electrical Design (5 Sheets)

Description	Tag Number [(1)]	Location	IEEE Class 1E [(2)]	EQ – Harsh Env.	PACS	MCR / RSS Displays	MCR / RSS Controls
Motor Operated Dampers	30KLA21AA001	Fuel Building	N/A	N/A	N/A	Position / Position	Open-Close / Open-Close
Motor Operated Dampers	30KLA22AA001	Fuel Building	N/A	N/A	N/A	Position / Position	Open-Close / Open-Close
Internal Filtration Train							
Motor Operated Damper	30KLA50AA002	Reactor Building	Division 2^N Division 1^A	Yes	Yes	Position / Position	Open-Close / Open-Close
Electric Heater	30KLA50AH001	Reactor Building	Division 2^N Division 1^A	Yes	Yes	On-Off / On-Off	Start-Stop / Start-Stop
Motor Operated Damper	30KLA50AA004	Reactor Building	Division 2^N Division 1^A	Yes	Yes	Position / Position	Open-Close / Open-Close
Recirculation Fans	30KLA51AN001	Reactor Building	Division 2^N Division 1^A	Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Recirculation Fans	30KLA52AN001	Reactor Building	Division 1^N Division 2^A	Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Instruments							
~~Pre-Filter DP Gauge~~	~~30KLA50CP501~~	~~Reactor Building~~	~~Division 2~~	~~Yes~~	~~Yes~~	~~N/A~~	~~N/A~~
~~HEPA Filter DP Gauge~~	~~30KLA50CP502~~	~~Reactor Building~~	~~Division 2~~	~~Yes~~	~~Yes~~	~~N/A~~	~~N/A~~
~~Iodine Adsorber DP Gauge~~	~~30KLA50CP503~~	~~Reactor Building~~	~~Division 2~~	~~Yes~~	~~Yes~~	~~N/A~~	~~N/A~~
~~Downstream HEPA Filter DP Gauge~~	~~30KLA50CP504~~	~~Reactor Building~~	~~Division 2~~	~~Yes~~	~~Yes~~	~~N/A~~	~~N/A~~

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Table 2.6.8-3—Containment Building Ventilation System Equipment I&C and Electrical Design
(5 Sheets)

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Description	Tag Number (1)	Location	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR / RSS Displays	MCR / RSS Controls
~~Iodine Filter DP Gauge~~	~~30KLA50CP505~~	~~Reactor Building~~	~~Division 2~~	~~Yes~~	~~Yes~~	~~N/A~~	~~N/A~~
~~Internal Filtration Train Flow Sensor~~	~~30KLA50CF001~~	~~Reactor Building~~	~~Division 2~~	~~Yes~~	~~Yes~~	~~Flow/Flow~~	~~N/A~~
~~Duct Air Temperature Sensor~~	~~30KLA50CT002~~	~~Reactor Building~~	~~Division 2~~	~~Yes~~	~~Yes~~	~~Temperature/ Temperature~~	~~N/A~~
~~Temperature Sensor Downstream of Electric Heater~~	~~30KLA50CT001~~	~~Reactor Building~~	~~Division 2~~	~~Yes~~	~~Yes~~	~~Temperature/ Temperature~~	~~N/A~~
Containment Pressure ~~Sensor~~	30KLA70CP801	Fuel Building	N/A~~Division 1~~	Yes	N/A	Pressure/ Pressure	N/A
Containment Pressure ~~Sensor~~	30KLA70CP802	Safeguard Building 2	N/A~~Division 2~~	Yes	N/A	Pressure/ Pressure	N/A
Containment Pressure ~~Sensor~~	30KLA70CP803	Safeguard Building 3	N/A~~Division 3~~	Yes	N/A	Pressure/ Pressure	N/A
Containment Pressure ~~Sensor~~	30KLA70CP804	Fuel Building	N/A~~Division 4~~	Yes	N/A	Pressure/ Pressure	N/A
Containment Pressure	30KLA60CP851	Fuel Building	N/A~~Division 1~~	Yes	N/A	Pressure/ Pressure	N/A
Containment Pressure	30KLA70CP851	Fuel Building	N/A~~Division 1~~	Yes	N/A	Pressure/ Pressure	N/A
Containment Pressure	30KLA60CP852	Safeguard Building 2	N/A~~Division 2~~	Yes	N/A	Pressure/ Pressure	N/A
Containment Pressure	30KLA70CP852	Safeguard Building 2	N/A~~Division 2~~	Yes	N/A	Pressure/ Pressure	N/A

Table 2.6.8-3—Containment Building Ventilation System Equipment I&C and Electrical Design (5 Sheets)

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Description	Tag Number (1)	Location	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR / RSS Displays	MCR / RSS Controls
Containment Pressure	30KLA60CP853	Safeguard Building 3	N/ADivision 3	Yes	N/A	Pressure/ Pressure	N/A
Containment Pressure	30KLA70CP853	Safeguard Building 3	N/ADivision 3	Yes	N/A	Pressure/ Pressure	N/A
Containment Pressure	30KLA60CP854	Fuel Building	N/ADivision 4	Yes	N/A	Pressure/ Pressure	N/A
Containment Pressure	30KLA70CP854	Fuel Building	N/ADivision 4	Yes	N/A	Pressure/ Pressure	N/A
Duct Air Temperature Downstream of Electric Heater	30KLA21CT001	Fuel Building	N/ADivision 1	Yes	N/A	Temperature/ Temperature	N/A
Duct Air Temperature Upstream of Electric Heater	30KLA21CT002	Fuel Building	N/ADivision 1	Yes	N/A	Temperature/ Temperature	N/A
Duct Air Flow	30KLA21CF001	Fuel Building	N/ADivision 1	Yes	N/A	Flow/Flow	N/A
Pre-Filter Dp	30KLA21CP501	Fuel Building	Division 1	Yes	N/A	N/A	N/A
HEPA Filter Dp	30KLA21CP502	Fuel Building	Division 1	Yes	N/A	N/A	N/A
Iodine Filter Dp	30KLA21CP503	Fuel Building	Division 1	Yes	N/A	N/A	N/A
HEPA Filter Dp	30KLA21CP504	Fuel Building	Division 1	Yes	N/A	N/A	N/A
Iodine Filter Differential PressureDp	30KLA21CP505	Fuel Building	N/ADivision 1	Yes	N/A	N/A	N/A
Duct Air Temperature Downstream of Electric Heater	30KLA22CT001	Fuel Building	N/ADivision 4	Yes	N/A	Temperature/ Temperature	N/A

Table 2.6.8-3—Containment Building Ventilation System Equipment I&C and Electrical Design (5 Sheets)

06.05.01-4

Description	Tag Number (1)	Location	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR / RSS Displays	MCR / RSS Controls
Duct Air Temperature Upstream of Electric Heater	30KLA22CT002	Fuel Building	N/ADivision 4	Yes	N/A	Temperature/ Temperature	N/A
Duct Air Flow	30KLA22CF001	Fuel Building	N/ADivision 4	Yes	N/A	Flow/Flow	N/A
Pre-Filter Dp	30KLA22CP501	Fuel Building	Division 4	Yes	N/A	N/A	N/A
HEPA Filter Dp	30KLA22CP502	Fuel Building	Division 4	Yes	N/A	N/A	N/A
Iodine Filter Dp	30KLA22CP503	Fuel Building	Division 4	Yes	N/A	N/A	N/A
HEPA Filter Dp	30KLA22CP504	Fuel Building	Division 4	Yes	N/A	N/A	N/A
Iodine Filter Differential PressureDp	30KLA22CP505	Fuel Building	N/ADivision 4	Yes	N/A	N/A	N/A
Temperature Downstream of Carbon Adsorbers	30KLA21CT003	Fuel Building	N/A	Yes	N/A	Temperature/ Temperature	N/A
Temperature Downstream of Carbon Adsorbers	30KLA22CT003	Fuel Building	N/A	Yes	N/A	Temperature/ Temperature	N/A

1) Equipment tag numbers are provided for information only and are not part of the certified design.

2) ^{N} denotes division the component is normally powered from, while ^{A} denotes division the component is powered from when alternate feed is implemented.

Table 1.8-2—U.S. EPR Combined License Information Items
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Item No.	Description	Section
6.1-1	A COL applicant that references the U.S. EPR design certification will review the fabrication and welding procedures and other QA methods of ESF component vendors to verify conformance with RGs 1.44 and 1.31.	6.1.1.1
6.1-2	If components cannot be procured with DBA-qualified coatings applied by the component manufacturer, a COL applicant that references the U.S. EPR design certification must do one of the following: procure the component as uncoated and apply a DBA-qualified coating system in accordance with 10 CFR 50 Appendix B, Criterion IX; confirm that the DBA-unqualified coating is removed and the component is recoated with DBA-qualified coatings in accordance with 10 CFR 50 Appendix B, Criterion IX; or add the quantity of DBA-unqualified coatings to a list that documents those DBA-unqualified coatings already existing within containment.	6.1.2.3.2
6.2-1	A COL applicant that references the U.S. EPR design certification will identify the implementation milestones for the CLRT program described under 10 CFR 50, Appendix J.	6.2.6
6.3-1	A COL applicant that references the U.S. EPR design certification will describe the containment cleanliness program which limits debris within containment.	6.3.2.2.2
6.4-1	Deleted.~~A COL applicant that references the U.S. EPR design certification will identify the type(s) of Seismic Category I Class IE toxic gas sensors (i.e., the toxic chemical(s) of concern) necessary for control room operator protection.~~	~~6.4.6~~
6.4-2	A COL applicant that references the U.S. EPR design certification will provide written emergency planning and procedures in the event of a radiological or a hazardous chemical release within or near the plant, and will provide training of control room personnel.	6.4.3
6.4-3	A COL applicant that references the U.S. EPR design certification will evaluate the results of the toxic chemical accidents from Section 2.2.3, ~~and~~ address their impact on control room habitability in accordance with RG 1.78, and if necessary, identify the types of sensors and automatic control functions required for control room operator protection.	6.4.14
6.4-4	A COL applicant that references the U.S. EPR design certification will confirm that the radiation exposure of main control room occupants resulting from a design basis accident at a nearby unit on a multi-unit site is bounded by the radiation exposure from the postulated design basis accidents analyzed for the U.S. EPR; or confirm that the limits of GDC-19 are met.	6.4.4

Table 3.2.2-1—Classification Summary
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KKS System or Component Code	SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program (Note 5)	Location (Note 17)	Comments/ Commercial Code
30SAB01/02/03/04 AA006	Outside Air Inlet Volume Control Dampers, Manually Adjusted	S	~~C~~N/A	I	Yes	UJK	ASME AG-1[14]
30SAB11/14 AT001	Pre-Filters	S	~~C~~N/A	I	Yes	UJK	ASME AG-1[14]
30SAB01/02/03/04 AC001	Recirc Air Cooling Coils with Safety Chilled Water	S	C	I	Yes	UJK	ASME ~~AG-1~~Class 3[3][14]
30SAB01/02/03/04 AA009	Recirculation Unit Isolation Dampers	S	~~C~~N/A	I	Yes	UJK	ASME AG-1[14]
30SAB01/02/03/04 BS003	Silencers on Fan Discharge Side	S	~~C~~N/A	I	Yes	UJK	ASME AG-1[14]
30SAB01/02/03/04 BS002	Silencers on Fan Suctions	S	~~C~~N/A	I	Yes	UJK	ASME AG-1[14]
30SAB01/04 SD001	Smoke Detector	NS-AQ	~~D~~N/A	II	~~No~~Yes	UJK	Local Bldg. Code
30SAB 01/02/03/04 SD002	Smoke Detector	NS-AQ	~~D~~N/A	II	~~No~~Yes	UJK	Local Bldg. Code
~~30SAB01/04 TG001~~	~~Toxic Gas Sensor~~	~~S~~	~~C~~	~~I~~	~~Yes~~	~~UJK~~	~~ASME AG-1[14]~~
30SAB01/02/03/04 AN001	Supply Air Fans	S	~~C~~N/A	I	Yes	UJK	ASME AG-1[14]
30SAB45 AA003	Upstream Exhaust Air Isolation Damper	S	~~C~~N/A	I	Yes	UJK	ASME AG-1[14]

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Table 3.11-1—List of Environmentally Qualified Electrical/I&C Equipment (Sheet 120 of 134)

06.04-7

Name Tag (Equipment Description)	Tag Number	Local Area KKS ID (Room Location)	EQ Environment (Note 1)	Radiation Environment Zone (Note 2)	EQ Designated Function (Note 3)	Safety Class (Note 4)	EQ Program Designation (Note 5)
SAB11 Filtr Train Iso Dmpr Dwnstrm	30SAB11AA003	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
SAB11 Filtr Train Recirc Iso Dmpr	30SAB11AA004	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
SAB11 Filtration Trn Electric Preheater	30SAB11AH001	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Iodine Filtr. Inlet Iso. Damper - Div 4	30SAB14AA001	33UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
SAB14 Filtr Train Iso Dmpr Dwnstrm	30SAB14AA003	33UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
SAB14 Filtr Train Recirc Iso Dmpr	30SAB14AA004	33UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
SAB14 Recirc Backdraft Damper	30SAB14AA005	32UJK31034	M	M	SII	NS-AQ	Y (5) Y (6)
SAB14 Filtration Trn Electric Preheater	30SAB14AH001	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Exhaust Air Recirc. Vol Contr Damper A	30SAB42AA001	32UJK26031	M	M	SI	S 1E EMC	Y (5) Y (6)
Exhaust Air Isolation Damper - A	30SAB45AA003	32UJK31020	M	M	SI	S 1E EMC	Y (5) Y (6)
Exhaust Air Isolation Damper - B	30SAB45AA004	32UJK31020	M	M	SI	S 1E EMC	Y (5) Y (6)
Recirc. Vol. Cont. Posit. Indic. - Div 1	30SAB01CG012	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Recirc. HEPA DP - Div 1	30SAB01CP002	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Makeup Air Pre-Filter DP - Div 1	30SAB01CP501	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Recirc. HEPA DP (Local) - Div 1	30SAB01CP504	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Makeup Air Inlet Temp - Div 1	30SAB01CT001	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Makeup Air Heater Outlet Temp - Div 1 A	30SAB01CT002	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Makeup Air Heater Outlet Temp - Div 1 B	30SAB01CT003	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Makeup Air Heater Outlet Temp - Div 1 C	30SAB01CT004	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Recirc. CoolCoil Inlet Temp (Local) -Div 1	30SAB01CT501	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Recirc. CoolCoil Exit Temp (Local) -Div 1	30SAB01CT502	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Smoke Detector	30SAB01SD001	32UJK31034	M	M	SII	NS-AQ	Y (5) Y (6)
~~Toxic Gas Sensor~~	~~30SAB01TG001~~	~~32UJK31034~~	~~M~~	~~M~~	~~SI~~	~~S 1E EMC~~	~~Y (5) Y (6)~~
Recirc. HEPA DP - Div 2	30SAB02CP002	32UJK31035	M	M	SI	S 1E EMC	Y (5) Y (6)
Recirc. HEPA DP (Local) - Div 2	30SAB02CP504	32UJK31035	M	M	SI	S 1E EMC	Y (5) Y (6)
Recirc. CoolCoil Inlet Temp (Local) -Div 2	30SAB02CT501	32UJK31035	M	M	SI	S 1E EMC	Y (5) Y (6)
Recirc. CCoil Outlet Temp (Local) - Div 2	30SAB02CT502	32UJK31035	M	M	SI	S 1E EMC	Y (5) Y (6)
Recirc. HEPA DP - Div 3	30SAB03CP002	33UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Recirc. HEPA DP (Local) - Div 3	30SAB03CP504	33UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Recirc CoolCoil Inlet Temp (Local) -Div 3	30SAB03CT501	33UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Recirc. Cool Coil Exit Temp (Local) -Div 3	30SAB03CT502	33UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Recirc Vol Cont Damp Position Indic-Div 4	30SAB04CG012	33UJK31035	M	M	SI	S 1E EMC	Y (5) Y (6)
Recirc. HEPA DP - Div 4	30SAB04CP002	33UJK31035	M	M	SI	S 1E EMC	Y (5) Y (6)

Table 3.11-1—List of Environmentally Qualified Electrical/I&C Equipment (Sheet 121 of 134)

06.04-7

Name Tag (Equipment Description)	Tag Number	Local Area KKS ID (Room Location)	EQ Environment (Note 1)	Radiation Environment Zone (Note 2)	EQ Designated Function (Note 3)	Safety Class (Note 4)	EQ Program Designation (Note 5)
Makeup Air Pre-Filter DP - Div 4	30SAB04CP501	33UJK31035	M	M	SI	S 1E EMC	Y (5) Y (6)
Recirc. HEPA DP (Local) - Div 4	30SAB04CP504	33UJK31035	M	M	SI	S 1E EMC	Y (5) Y (6)
Makeup Air Inlet Temp - Div 4	30SAB04CT001	33UJK31035	M	M	SI	S 1E EMC	Y (5) Y (6)
Makeup Air Heater Outlet Temp - Div 4 A	30SAB04CT002	33UJK31035	M	M	SI	S 1E EMC	Y (5) Y (6)
Makeup Air Heater Outlet Temp - Div 4 B	30SAB04CT003	33UJK31035	M	M	SI	S 1E EMC	Y (5) Y (6)
Makeup Air Heater Outlet Temp - Div 4 C	30SAB04CT004	33UJK31035	M	M	SI	S 1E EMC	Y (5) Y (6)
Recirc CoolCoil Inlet Temp (Local) - Div 4	30SAB04CT501	33UJK31035	M	M	SI	S 1E EMC	Y (5) Y (6)
Recirc. CoolCoil Exit Temp (Local) - Div 4	30SAB04CT502	33UJK31035	M	M	SI	S 1E EMC	Y (5) Y (6)
Smoke Detector	30SAB04SD001	32UJK31034	M	M	SII	NS-AQ	Y (5)
~~Toxic Gas Sensor~~	~~30SAB04TG001~~	~~32UJK31034~~	~~M~~	~~M~~	~~SI~~	~~S 1E EMC~~	~~Y (5) Y (6)~~
Iodine Filtr. Filter DP - Div 1	30SAB11CP001	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Iodine Filtration Pre-Filter DP - Div 1	30SAB11CP501	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Iodine Filtr. Inlet HEPA DP - Div1	30SAB11CP502	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Iodine Filtration Charcoal DP - Div 1	30SAB11CP503	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Iodine Filtration Outlet HEPA DP - Div 1	30SAB11CP504	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
SAB11 Filtr Train Temp Sens 1	30SAB11CT001	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
SAB11 Filtr Train Temp Sens 2	30SAB11CT002	32UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Iodine Filtration Filter DP - Div 4	30SAB14CP001	33UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Iodine Filtration Pre-Filter DP - Div 4	30SAB14CP501	33UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Iodine Filtration Inlet HEPA DP - Div 4	30SAB14CP502	33UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Iodine Filtration Charcoal DP - Div 4	30SAB14CP503	33UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
Iodine Filtration Outlet HEPA DP - Div 4	30SAB14CP504	33UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
SAB14 Filtr Train Temp Sens 1	30SAB14CT001	33UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
SAB14 Filtr Train Temp Sens 2	30SAB14CT002	33UJK31034	M	M	SI	S 1E EMC	Y (5) Y (6)
MCR Supply Duct Heater Oultet Air Flow	30SAB32CF001	32UJK26030	M	M	SI	S 1E EMC	Y (5) Y (6)
Tag/Shift Off Supply Duct Heat Exit Flow	30SAB32CF002	33UJK26030	M	M	SI	S 1E EMC	Y (5) Y (6)
WC & Kitchen Supply Duct Heat Exit Flow	30SAB32CF003	32UJK26015	M	M	SI	S 1E EMC	Y (5) Y (6)
Kitchen Supply Duct Heater Exit Flow	30SAB32CF004	33UJK26044	M	M	SI	S 1E EMC	Y (5) Y (6)
I&CService Supply Duct Heat Exit Flow	30SAB32CF005	33UJK26034	M	M	SI	S 1E EMC	Y (5) Y (6)
Special Use Supply Duct Heater Exit Flow	30SAB32CF006	33UJK26032	M	M	SI	S 1E EMC	Y (5) Y (6)
TechSupport Supply Duct Heater Exit Flow	30SAB32CF007	33UJK26030	M	M	SI	S 1E EMC	Y (5) Y (6)
DP between MCR and Anteroom A	30SAB32CP001	32UJK26030	M	M	SI	S 1E EMC	Y (5) Y (6)
DP between MCR and Anteroom B	30SAB32CP002	32UJK26030	M	M	SI	S 1E EMC	Y (5) Y (6)

6.2.3.2.2.3 System Operation

The normal operation filtration train is in service during normal plant operation, including cold shutdown and outages. During normal operation, the isolation dampers are in the open position and the annulus is continuously vented. The subatmospheric pressure inside the annulus is maintained by regulating the control damper located on the supply side of the normal operation filtration train. The supply air from the AVS maintains the annulus temperature between 45°F and 113°F.

A failure of the normal operation filtration train leads to the loss of supply and exhaust air to the annulus. In this case, one of the accident filtration trains is started, and the two isolation dampers on the supply and exhaust side of the normal filtration train are closed to isolate the normal operation filtration train and maintain the leak tightness of the annulus.

In case of a postulated accident, a containment isolation signal causes the normal filtration train to automatically stop. The normal filtration train supply air isolation dampers close immediately and the exhaust isolation dampers close with a delay, to maintain the annulus negative pressure during the switchover to the accident filtration trains. Both accident filtration trains start on receipt of a containment isolation signal and an alarm is issued in the MCR.

6.2.3.2.3 Bypass Leakage

Certain containment penetrations introduce the potential for primary containment leakage to bypass the filtered annulus and escape directly to the environment. Potential bypass leakage paths exist through the double seals of the equipment hatch, personnel airlocks, fuel transfer tube, and containment ventilation system isolation valves.

06.02.03-8

The leak-off system provides a means to capture bypass leakage and route it to the annulus to be processed. The leak-off system is located in the Reactor Containment Building, Reactor Building Annulus, Fuel Building, and Safegurard Buildings 2 and 3, and consists of valves, sensors and piping. It is composed of three main subsystems: containment leakage exhaust subsystem (CLES), containment inflating/deflating subsystem (CIDS), and containment leak-tightness test subsystem (CLTS).~~has no components with an active safety function. The subatmospheric pressure in the annulus provides the driving force to route the bypass leakage to the annulus.~~ The CLES collects leaks from various systems and components in the Reactor Containment Building, Fuel Building, and Safegurard Buildings, and transports the leakage to the Reactor Building Annulus. The CIDS is used for the pressurization, depressurization, and evacuation of the Reactor Containment Building in order to test the structural integrity and leak-tightness of the Reactor Containment Building. The CLTS uses sensors in the Reactor Containment Building, Fuel Building, and Reactor Building

Annulus and the environment to estimate the leak-tightness of the Reactor Containment Building.

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The CLES contains piping to collect leakage from components located at containment penetrations at the interface boundary between the Reactor Containment Building and Reactor Building Annulus, the Reactor Building Annulus and the environment, and the Fuel Building and Safegurard Building 3. During normal operation, the CLES collects leakage in leak-off lines and routes the leakage to the Reactor Building Annulus. Subatmospheric pressure in the Reactor Building Annulus, provided by the annulus ventilation system (AVS), creates a pressure differential, which drains the CLES leakage. Discharge piping from the CLES is routed to a floor drain in the nuclear island drain and vent system located in the Reactor Building Annulus.

The leak-off system is functional during normal ~~plant~~ operation and ~~during~~ postulated accidents. During design basis accidents, valves in the CLES are open. Leaks from components (valves, hatch seals) are collected and drained to the Reactor Building Annulus by the pressure differential created by the AVS. Leak-off system component classifications are presented in Section 3.2.

Containment penetrations that are paths for potential bypass leakage terminate in areas of the surrounding buildings that are filtered during a postulated accident. Section 6.2.6.5 addresses the treatment of bypass leakage for containment leakage rate testing.

6.2.3.3 Safety Evaluation

The AVS system components are located inside the Fuel Building, which is a Seismic Category I structure. The two AVS accident filtration trains are designed to withstand the safe shutdown earthquake and are classified as Seismic Category I.

The safety-related components of the AVS system remain functional and perform their intended function following a postulated internal hazard (e.g., fire, flood, internal missiles, pipe breaks). The two accident filtration trains are physically separated from each other to prevent common mode failures. Since the accident filtration trains are completely redundant and are both full capacity, one train alone can collect and process radioactive material that may leak from the primary containment following an accident. The supply and exhaust trains of the normal filtration train can be isolated with two redundant dampers in series.

Guard pipes surround high energy lines passing through the annulus to protect against pipe failures that could compromise the integrity of the secondary containment. Design criteria for guard pipes are presented in Section 3.6.2.2. Containment penetrations are listed in Section 6.2.4. Doors and hatches leading to the annulus are maintained under administrative control.

~~plant operating modes. Lighting inside filter banks between the rows of filters and inspection portholes in the filter housing doors allow for viewing while in operation.~~

6.2.3.5 Instrumentation Requirements

06.05.01-4

Indication of the operational status of the AVS equipment, position of dampers, instrument indications and alarms are provided in the MCR. Fans, motor-operated dampers, and heaters ~~and cooling units~~ are operable from the MCR. Local instruments are provided to measure differential pressure across filters, flow, temperature and pressure. The fire detection and sensors information is delivered to the fire detection system. The radiation instrumentation requirements for controlling airborne radioactivity releases via the vent stack are addressed in Section 11.5.

The minimum instrumentation, indications, and alarms for the AVS ESF filter systems is provided in Table 6.2.3-3 per the requirements of ASME N509 (Reference 27).

Table 6.2.3-3—Instrumentation, Indication, and Alarm Features for AVS (Accident Filtration Trains)

Sensing Location	Local Indication / Alarm	MCR Indication / Alarm
Unit Inlet Moisture Separator	Pressure Drop Indication	
Electric Heater Inlet	Temperature Indication	
Electric Heater	Status Indication	Status Indication
Electric Heater Outlet	Temperature Indication	Temperature Indication / High Temperature Alarm
Prefilter	Pressure Drop Indication / High Alarm	
Upstream-HEPA	Pressure Drop Indication / High Alarm	
Adsorber	Pressure Drop Indication / High Alarm	
Adsorber Outlet	Temperature Indication	Temperature Indication / High Temperature Alarm
Post-filter	Pressure Drop Indication / High Alarm	
System Filters Inlet to Outlet		Summation of pressure drop across entire filtration train (Indication / High Pressure Drop Alarm)
Fan	Pressure Drop Indication	Handswitch / Status Indication
Damper / Operator	Position Indication	Position Indication
Unit Outlet	Flow Rate Indication	Flow Rate (recorded indication, high alarm signal)
Unit Outlet	Radiation Indication	Radiation Indication / High Radiation Alarm

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Next File

14. ASME Boiler and Pressure Vessel Code, Section III, "Rules for Construction of Nuclear Facility Components," The American Society of Mechanical Engineers, 2004 Edition.

15. ANP-10299P, Revision 2, "Applicability of AREVA NP Containment Response Evaluation Methodology to the U.S. EPR for Large Break LOCA Analysis," AREVA NP Inc., December 2009.

16. Frank Kreith, "Principles of Heat Transfer," 3rd edition, New York: Intext Educational Publishers, 1973.

17. IEEE 334-1974, "IEEE Standard for Type Tests of Continuous-Duty Class 1E Motors for Nuclear Power Generating Stations", Institute of Electrical and Electronics Engineers, 1974.

18. ANSI/AMCA-210-99, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating," American National Standards Institute/Air Movement and Control Association International, December 1999.

19. ANSI/AMCA 211-1987, "Certified Ratings Program -Air Performance, "American National Standards Institute/Air Movement and Control Association International, 1987.

20. ANSI/AMCA-300-1985, "Reverberant Room Method of Testing Fans for Rating Purposes," American National Standards Institute/Air Movement and Control Association International, 1985.

21. ANSI/ASHRAE Standard 52.2-1999, "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size," American Society of Heating, Refrigerating and Air Conditioning Engineers, 1999.

22. "HVAC Air Duct Leakage Test Manual," Sheet Metal and Air Conditioning Contractors' National Association, 1985.

23. ASME N510-1989 (R1995), "Testing of Nuclear Air-Treatment Systems," The American Society of Mechanical Engineers, 1989.

24. ASME AG-1, "Code on Nuclear Air and Gas Treatment," The American Society of Mechanical Engineers, 1997 (including the AG-1a-2000, "Housings" Addenda).

25. NRC Regulatory Guide 1.52, Rev. 3, "Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Post Accident Engineered Safety Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants," 2001.

26. ASTM D3803-1989, reapproved 1995, "Standard Test Method for Nuclear Grade Activated Carbon," 1989.

06.05.01-4

27. ASME N509-1989, "Nuclear Power Plant Air Cleaning Units and Components," The American Society of Mechanical Engineers, 1989.

Next File

6.4 Habitability Systems

The main control room (MCR) habitability systems are designed to allow control room operators to remain in the MCR to operate the plant safely under normal conditions and to maintain the plant in a safe state under accident conditions.

06.04-7

The habitability systems protect the control room operators from the effects of accidental releases of ~~toxic and~~ radioactive gases. The systems also provide the necessary support for the Technical Support Center (TSC) personnel in case of an accident or abnormal event. The TSC is contained within the control room envelope (CRE).

The term "habitability systems" refers to equipment, supplies, and procedures. The habitability equipment is defined in Section 6.4.2.1.

Control room habitability system objectives include:

- Missile protection and radiation shielding (Section 3.8).
- Air filtration (Section 6.5.1, Section 9.4.1).
- Pressurization and air conditioning (Section 9.4.1).
- Fire protection (Section 9.5.1).
- Radiation monitoring (Section 12.3.4).

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- ~~Detection of and protection from toxic gases (to include carbon monoxide (CO) and carbon dioxide (CO_2)) (Section 9.4.1).~~
- Detection of ~~S~~smoke (Section 9.4.1).
- Lighting (Section 9.5.3).
- Personnel support.

6.4.1 Design Basis

Control room habitability is provided, so that the plant can be operated safely under normal conditions, and maintained safely under accident conditions or abnormal events. These design bases relate to MCR habitability:

- Habitability systems are designed to accommodate the effects of environmental conditions associated with normal operation, maintenance, testing, and postulated accidents and are protected against dynamic effects that may result from equipment failures and from events and conditions outside the nuclear power unit (GDC 4).

- The MCR habitability systems are not shared among multiple nuclear power units (GDC 5).

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- The CRE is protected from toxic gases release which include CO and CO_2 to permit access and occupancy of the MCR under accident conditions (GDC 19).
- The CRE is protected from hazardous chemicalradiological releases and outside fire or smoke events to permit access and occupancy of the MCR.
- The MCR air conditioning system (CRACS) provides the capability to isolate the CRE from the surrounding areas, pressurize the CRE to prevent in-leakage, and filter supply air to remove radioactive halogens (10 CFR 50.34(f)(2)(xxviii)).
- The air intake structures are physically separated and located away from potential radiological sources, (10 CFR 50.34(f) (2) (xxviii)).
- The TSC is designed in accordance with NUREG-0696 (Reference 6). A space of at least 1875 ft^2, within the integrated operations area, is allocated to the TSC. Therefore, the TSC is large enough to provide space for 25 personnel at 75 ft^2 per person.
- The CRE design permits periodic testing and in-service inspection to confirm integrity.
- The volume of the CRE is approximately 200,000 ft^3. With the CRE operating in a full recirculation alignment, the air inside the CRE can support five persons in the MCR and twenty-five persons in the TSC (Integrated Support Center) for at least one and one-half days.

The CRACS design bases are presented in Section 9.4.1.

06.04-7

The evaluation of potential toxic chemical accidents is addressed by the COL applicant in Section 2.2.3 and includes the identification of toxic chemicals. A COL applicant that references the U.S. EPR design certification will evaluate the results of the toxic chemical accidents from Section 2.2.3, address their impact on control room habitability in accordance with RG 1.78, and if necessary, identify the types of sensors and automatic control functions required for control room operator protection.

6.4.2 System Design

6.4.2.1 Definition of Control Room Envelope

The MCR contains the equipment necessary to monitor and control the plant during all operating conditions and to bring the plant to a safe shutdown state.

The CRE comprises these areas:

- Main control room.

- Shift supervisor's office.
- Integrated operations area including:
  - Technical support center.
  - NRC office area.
  - Break area.
- Restroom facilities.
- Instrumentation and controls (I&C) service center.
- Service corridors.
- Computer rooms.
- Equipment rooms that contain MCR ventilation supply, filtration, and air conditioning systems.

The CRE is housed within Safeguard Buildings 2 and 3. The CRE is shown in Figure 6.4-1—Control Room Envelope Plan View 1, Figure 6.4-2—Control Room Envelope Plan View 2, and Figure 6.4-3—Control Room Envelope Elevation View. The total free-air volume of the CRE is approximately 200,000 ft^3.

These personnel support items are maintained within the confines of CRE in sufficient quantities for required operational personnel:

- Non-perishable food supply and drinking water.
- Emergency medical supply kits.

06.04-7

- SCBA units, air supply equipment and protective clothing for protection from smoke in accordance with RG 1.189., and toxic gases.
  - SCBA units contain a minimum of six hours of air supply capacity, as specified by RG 1.78.

Food, water, and medical needs of the control room personnel are met using the site emergency preparedness process for providing these services to emergency centers, following the guidance of NUREG-0654 (Reference 1). Emergency planning is addressed in Section 13.3.

6.4.2.2 Ventilation System Design

The CRACS design is described in Section 9.4.1, which identifies and describes major components, design parameters and classifications, instrumentation and controls, and provides a system schematic. Figure 15.0-4 presents airflows through the system for post-accident filtration. Section 6.5.1 describes the engineered safety features (ESF) filter systems and fission product removal capability for the CRACS.

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Section 3.8.4 contains elevation and plan views of the Safeguard Buildings. Figure 2.3-1 provides the relative locations of potential radiological release points and the CRACS air intakes. ~~The evaluation of potential toxic chemical accidents is addressed in Section 2.2.3.~~ Figure 6.4-1 through Figure 6.4-3 illustrate the CRE layout, including surrounding corridors, doors, stairwells and shielded walls.

One outside air intake for the CRACS is located in Safeguard Building 2 and the other is located at a separate location on Safeguard Building 3, to prevent intrusion of ~~toxic gases (includes CO and CO_2) or~~ radiological contamination.

The CRACS intakes are located on the roof of Safeguard Buildings 2 and 3~~, to prevent intrusion of toxic gases or radiological contamination~~. The two intakes are physically separated and are removed from potential radiological release points, including the main steam relief exhaust, the Safeguard Building depressurization shafts, and the vent stack, in both lateral and vertical directions. Section 15.0.3 identifies the bounding atmospheric release point used in the radiological analyses.

Radiation monitors (R-29 and R-30, Table 11.5-1) in the CRACS supply air duct continuously measure the concentration of radioactive materials in the supply air. The control room airborne radioactivity monitoring system is addressed in Section 12.3.4 and Section 11.5.3.1.11.

The main features related to control room habitability of the CRACS design are:

- Under normal operating conditions:
  - The ventilation system operates in the recycling mode with fresh air makeup.

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  - The air makeup rate corresponds to the exhausts from the kitchen and restrooms ~~rooms~~ and leakage out of the area ~~due to the controlled overpressure~~.
- The ventilation system maintains an ambient condition for comfort and safety of control room occupants and to support operability of the MCR components during normal operation, anticipated operational occurrences (AOO), and design bases accidents (DBA).
- The ventilation system maintains a positive pressure of 0.125 inches water gauge as a minimum within the CRE areas with respect to adjacent environmental zones to prevent uncontrolled, unfiltered in-leakage during normal and accident conditions. The filtered outside air supply rate during accident conditions corresponds to 0.3 volume changes per hour.

- During a site radiological contamination event, the air intake is redirected through the ESF filter system trains.

06.04-7

- ~~Control room operators are protected from toxic gases in accordance with RG 1.52, RG 1.78, and ASME AG-1 (Reference 2).~~
- The ventilation system can be operated in full recirculation mode without outside air makeup during DBAs~~ or events involving toxic gas releases~~. The recirculated airflow rate is ~~17~~3,000 cfm to the CREF unit.
- The ventilation system provides adequate capacity for proper temperature within the CRE.
  - Redundancy for air cooling~~,~~ and filtration~~, and toxic gas protection~~ is provided by having two independent trains for critical functions.
  - Redundancy is provided for proper operation of the system when one active component is out of service.
  - Power supplies of the active components are backed up with emergency power so that they function in case of a loss of offsite power.
  - Each CRACS train has the capability to remove the design heat load. Each CRACS coiling coil (30 SAB01 AC001, 30 SAB02 AC001, 30 SAB03 AC001, and 30 SAB04 AC001) has a ~~maximum~~total cooling capacity of ~~355~~470,000 Btu/hr and is designed in accordance with ASME AG-1 (Reference 2).

6.4.2.3 Leak-tightness

The CRACS is maintained in a manner that minimizes the unfiltered in-leakage across the CRE boundary. Adequate leak-tightness for air sealing components supports control room operator habitability within the CRE boundary during normal operation, AOOs and DBAs.

Leak-tightness provisions for pressure boundary components are:

- Pipe penetrations are sealed and tested for air leakage after initial construction.
- Cable penetrations are sealed and tested for air leakage after initial construction.
- Doors used for personnel or equipment access are sealed and remain substantially air-tight to maintain pressurization of the CRE area. Doors are arranged to allow access by necessary operational personnel and maintain pressurization of the CRE area. Two access doors are arranged in series to form a configuration similar to an air lock, minimizing in-leakage from surrounding areas.
- Open ended drain lines are provided with water seals.

06.04-6

- ~~All b~~Building joints within the CRE boundary are sealed.

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The CRACS maintains a positive pressure of ≥ -0.125 inches of water gauge as a minimum within the CRE boundary during accident conditions, which limits unfiltered in-leakage through walls, ceiling, doors, pipes and cable penetrations.

06.04-8

The CRE boundary limits leakage from adjacent environmental zones to a maximum of 5040 cfm unfiltered in-leakage plus 10 cfm for CRE ingress and egress, in accordance with RG 1.197 (Reference 7).. The system design requirements are provided in Section 9.4.1 and testing requirements are specified in the control room envelope habitability program in Technical Specifications Section 5.5.17.

6.4.2.4 Interaction with Other Zones and Pressure-Containing Equipment

The CRACS does not supply air to areas other than the CRE. The air supply filtration and air conditioning systems are within the pressure boundary, thus minimizing the potential in-leakage of contaminated air into the MCR through fan shafts or ductwork connections.

06.04-7

The CRE area is isolated in the event of an outside fire, external toxic gas release, or smoke., and excessive concentrations of CO or CO_2. Upon receipt of an alarm in the MCR from the toxic gas alarm located in the outside air inlet ducts for the CRACS, the control room emergency filtration (CREF) (iodine filtration) trains are automatically aligned to filter outside inlet air through the iodine filtration unit and the outside inlet isolation dampers at the location of the alarm is closed by an operator from the MCR.

Upon detection of a smoke alarm from the smoke detector located in the outside air inlet ducts for the CRACS, the operator in the MCR will close the outside inlet isolation dampers at the location of the alarm and place both CREF (iodine filtration) trains in the filtered alignment.

Fire barriers with a three hour fire rating enclose the MCR. Openings penetrating the fire barrier are furnished with both fire doors and fire dampers or approved fire rate seals meeting the associated barrier fire duration rating. In case of a fire within the CRE area, the room supply and exhaust are isolated by fire dampers and monitoring and control of the plant can be performed from the remote shutdown station (RSS). The RSS is located in a different fire zone and is on a different elevation than the MCR, and is not contained within the CRE boundary. The RSS is described in Section 7.4.

The CRACS does not interact with air conditioning equipment serving adjacent zones, minimizing the possibility of transferring toxic or radioactive gases into the CRE. Piping not connected or related to the equipment within the CRE boundary is routed outside the pressurized boundary of the CRE.

The MCR is not located near pressure-containing tanks, equipment, or piping, such as CO_2 tanks or steam lines, which upon failure could transfer dangerous or hazardous material to the CRE. However, portable self-contained breathing apparatus (SCBA) are available for use by the control room operators.

6.4.2.5 Shielding Design

Massive concrete structures separate the MCR from the reactor containment atmosphere and the external environment, as described in Section 3.8. The thick concrete walls prevent any significant direct radiation shine from outside the Safeguard Buildings. The MCR is protected against direct shine from the MCR charcoal filtration system by a 19 inch concrete floor. Radiation sources and shielding requirements are identified in Section 12.2 and Section 15.0.3. The MCR dose calculations that are presented in these sections identify the contribution from direct radiation shine and demonstrate that the total MCR dose under accident conditions is within regulatory limits.

6.4.3 System Operational Procedures

During normal plant operation, the CRACS maintains acceptable environmental conditions within the CRE boundary. Upon receipt of a high radiation signal in the air intakes or a primary containment isolation signal, the system is automatically switched so that the intake is routed through the CREF (iodine filtration) trains. The operating modes of the CRACS are described in Section 9.4.1.

06.04-7

~~Upon detection of any hazardous chemical from a toxic gas (to include CO and CO_2) alarm located in each outside air inlet for the CRACS, the CREF (iodine filtration) trains are automatically aligned to filter alignment (routes outside inlet air through the iodine filtration unit) and the outside inlet isolation dampers at the location of the alarm is closed by an operator from the MCR.~~

Upon detection of a smoke alarm from the smoke detector located in the outside air inlet ducts for the CRACS, the operator in the MCR will close the outside inlet isolation dampers at the location of the alarm and place both CREF (iodine filtration) trains in the filtered alignment.

~~The control room operator will take protective measures within a short period of time from the initiation of the toxic gas sensors and alarms. The operators are not subjected to prolonged exposures during this time. Storage provisions for SCBAs and procedures for their use allow operators to begin using the SCBAs within a short period of time after detection of a radiological event or a hazardous release.~~

A COL applicant that references the U.S. EPR design certification will provide written emergency planning and procedures in the event of a radiological or a hazardous chemical release within or near the plant, and will provide training of control room personnel.

6.4.4 Design Evaluations

Section 9.4.1 contains the design evaluation of the CRACS. Fire protection inside and outside the CRE boundary is addressed in Section 9.5.1.

The total effective dose equivalent (TEDE) for the MCR occupants throughout the duration of any postulated DBA does not exceed the limits of GDC 19. The evaluation of radiological exposure to control room operators and the dose calculation model for the MCR is described in Section 15.0.3.

06.04-7

The CRE is designed, maintained and tested in accordance with RG 1.196 and RG 1.197. Habitability systems provide the capability to detect and protect personnel within the CRE boundaries from external fires, smoke, ~~toxic gases~~ and airborne radioactivity.

A COL applicant that references the U.S. EPR design certification will confirm that the radiation exposure of MCR occupants resulting from a DBA at a nearby unit on a multi-unit site is bounded by the radiation exposure from the postulated design basis accidents analyzed for the U.S. EPR; or confirm that the limits of GDC 19 are met.

~~The evaluation of potential toxic chemical accidents is addressed by the COL applicant in Section 2.2.3 and includes the identification of toxic chemicals. A COL applicant that references the U.S. EPR design certification will evaluate the results of the toxic chemical accidents from Section 2.2.3 and address their impact on control room habitability in accordance with RG 1.78.~~

6.4.5 Testing and Inspection

Testing and inspection of the CRACS are described in Section 9.4.1. Refer to Section 14.2 (test abstract #082) for initial plant testing.

Periodic testing to confirm CRE integrity is performed using testing methods and at testing frequencies consistent with RG 1.197. The air in-leakage test (tracer gas test) of the CRE boundary is performed in accordance with ASTM E741 (Reference 3). Air quality testing is performed in accordance with ANSI/ASHRAE 52.2 (Reference 4) and ASME N510 (Reference 5).

The control room envelope habitability program in Technical Specifications Section 5.5.17 defines testing requirements.

6.4.6 Instrumentation Requirements

The instrumentation and control features of the CRACS are described in Section 9.4.1. Radiation monitoring equipment for the CRE is described in Section 12.3.4, Section 11.5.3.1.11 and Table 11.5-1, Monitors R-29 and R-30.

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Toxic chemicals whose release has the potential to affect control room operators are monitored by toxic gas sensors. A COL applicant that references the U.S. EPR design certification will identify the type(s) of Seismic Category I Class IE toxic gas sensors (i.e., the toxic chemical(s) of concern) necessary for control room operator protection.

6.4.7 References

1. NUREG-0654/FEMA-REP-1 Revision 1, “Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants,” U.S. Nuclear Regulatory Commission, November 1980.

2. ASME AG-1-2003, “Nuclear Air and Gas Treatment,” The American Society of Mechanical Engineers, 2003ASME AG-1, "Code on Nuclear Air and Gas Treatment," The American Society of Mechanical Engineers, 1997 (including the AG-1a-2000, "Housings" Addenda).

3. ASTM E741–2000, “Standard Test Methods for Determining Air Change in a Single Zone by Means of a Tracer Gas Dilution,” American Society for Testing and Materials, 2000.

4. ANSI/ASHRAE 52.2-1999, “Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size,” American Society of Heating, Refrigerating and Air-Conditioning Engineers, 1999.

5. ASME N510-1989 (R1995), “Testing of Nuclear Air-Treatment Systems,” The American Society of Mechanical Engineers, 1989.

6. NUREG-0696, "Functional Criteria for Emergency Response Facilities," U.S. Nuclear Regulatory Commission, February 1981.

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7. NRC Regulatory Guide 1.197, "Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors," 2003.

- CRACS: 15 kW nominal heater rating.
- CBVS: 14 kW nominal heater rating.

Prefilters

The prefilters are located upstream of the HEPA filters and increase the life of the HEPA filters by collecting the larger particles. The prefilters maintain a minimum rated efficiency of 55–65 percent, which prevents the HEPA filters from becoming overloaded during radiological release events. The prefilters meet the requirements of ASHRAE Standard 52 (Reference 4). The filters are equipped with local differential pressure measurement, which indicates the degree of particulate loading and the need for filter change.

Moisture Separator

The moisture separator is a combination of moisture separator and prefilter. The moisture separator must meet the requirements of RG 1.52 (Reference 10), ASME N509 (Reference 1), and ASME AG-1 (Reference 3). The moisture separator is located upstream of the filter air heater and the HEPA prefilter. The moisture separator shall be a design that has been qualified by testing in accordance with the procedures described in Reference 1. Moisture separators must be capable of removing at least 99 percent by weight of entrained moisture in an air stream containing approximately 1.5–2 lb of entrained water per 1000 cubic feet, per Reference 1. Fiberglass knitted media within the moisture separator removes airborne particulates, which prevents the HEPA filters from becoming overloaded during radiological release events. The filters are equipped with local differential pressure measurement, which indicates the degree of particulate loading and the need for filter change.

HEPA Filters

06.05.01-2

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HEPA filters are located upstream ~~and downstream~~ of the carbon adsorbers to prevent contamination of the carbon adsorbers ~~and charcoal loss~~. A single HEPA filter standard size is rated for 1,500 cfm of air flow and has a dust loading capacity of 1,140 grams. The HEPA filter has an initial pressure drop of 1.3 inches of water gauge and approximately 3 inches of water gauge with a full dust loading. The maximum mass loading of the HEPA filters resulting from a design basis accident is as follows:

- Annulus exhaust filtration system (AVS): 822 mg.
- Safeguard Building exhaust filtration system (SBVS): 631 mg.
- Main Control Room emergency filtration system (CRACS): 0.007 mg.

The filters are equipped with local differential pressure measurements that indicate the degree of load and the need for a filter change. HEPA filters are designed, constructed, qualified, and factory tested in accordance with ASME AG-1 (Reference 3). Each HEPA filter cell is manufacturer tested to achieve an efficiency of at least 99.97 percent and, once installed, is tested periodically according to ASME N510 (Reference 2) to confirm an efficiency of at least 99.95 percent.

Carbon Adsorbers

06.05.01-2

The radiological filters use activated charcoal with no more than 5 percent of impregnant to adsorb airborne radioiodine from the air. Carbon filters are designed to meet the requirements of RG 1.52 and the design of the carbon adsorber shall be ≤ 2.5 mg of total iodine per gram of charcoal. The maximum charcoal loading for the carbon adsorbent trains is as follows:

- Annulus exhaust filtration system (AVS): 0.08 mg/g
- Safeguard Building exhaust filtration system (SBVS): 0.94 mg/g
- Main Control Room emergency filtration system (CRACS): 2.0E-06 mg/g.

Each ~~of the~~ ESF carbon adsorber~~s~~ contains a four-inch-deep carbon bed with an average atmospheric residence time of 0.25 seconds per two inches of adsorber bed thickness and a laboratory decontamination efficiency of ≥ 99 percent, as tested per ASTM D3803 (Reference 5). Downstream of the carbon adsorbers, a HEPA filter removes entrained charcoal. Charcoal trays and screens are fabricated using all-welded construction to preclude potential loss of charcoal. The carbon adsorbers are equipped with differential pressure measurement to indicate the need for filter replacement. Carbon adsorbers are constructed, qualified, and tested in accordance with ASME AG-1 (Reference 3).

The maximum component temperature in the carbon adsorber section with normal air flow through the unit is 122°F. The maximum component temperature in the carbon adsorber section with the fan shut down and the carbon adsorption unit isolated post-LOCA is 148°F. The ignition temperature of the carbon adsorber is 625°F. The recommended limitation of the filter operating temperature is 250°F, per Nuclear Air Cleaning Handbook (Reference 11). A comparison of the recommended limitation of the filter operating temperature with the lower temperature of the isolated post-LOCA carbon adsorption unit, demonstrates that isolation provides an acceptable means of fire protection.

Fans

The fans used in the ventilation systems are exhaust fans. The fans are electric motor driven and are radial, axial, or centrifugal type, according to the system flow and pressure requirements. Fan operating characteristics, including flow rate and static head, are measured to confirm the required air delivery flow rates. Fan performance is

- CBVS: ≥ 2700 cfm and ≤ 3300 cfm (nominal 3000 cfm), face velocity 375 fpm, configuration 2 High x 1 Wide.

The ESF filter systems in the CRACS, AVS, and SBVS are aligned automatically with their associated ventilation systems upon receipt of an ESF actuation signal, including safety injection, or detection of high radiation levels (refer to Table 11.5-1, Monitors R-29 and R-30 (CRACs) and R-25 (SBVS)). The ESF filter systems may also be manually aligned. The ESF filter systems can also be aligned to the FB and the containment area during fuel handling of irradiated fuel assemblies. The systems are placed in line with the FBVS and CBVS in case of a fuel handling accident. With this ESF filter system alignment, the offsite release of radioactive material from a fuel handling accident does not exceed regulatory limits. During containment purging, the ESF filters in the low-flow purge exhaust subsystem of the CBVS are aligned to reduce radioactive releases in case of a rod ejection accident occurring during purging operations.

Each ESF filter system is sized to accommodate the required ventilation flow and to remove greater than 99 percent of the fission products that could be entrained in the air. The ESF filter systems conform to the requirements of RG 1.52.

Performance evaluations of the ventilation systems that operate in conjunction with the ESF filter systems to limit fission product release to the environment or the MCR are presented in the sections corresponding to the ventilation systems.

6.5.1.4 Tests and Inspections

Refer to Section 14.2 (test abstracts #076, #077, #082, and #083) for initial plant testing of the ESF filter systems. Routine testing and inspection of ESF filter systems are conducted under the ventilation filter testing program in Technical Specifications Section 5.5.10. Laboratory testing of samples of activated carbon adsorber material is performed in accordance with ASTM D3803 (Reference 5) and RG 1.52.

6.5.1.5 Instrumentation Requirements

06.05.01-4

Instrumentation and controls provide automatic operation and remote control of the ESF filter systems and continuous indication of system parameters. ~~Instrumentation and controls related to the ESF filters are described with the associated ventilation systems in the corresponding sections. Instrumentation and controls for ESF filter systems are provided in Table 9.4.1-1—Minimum Instrumentation, Indication, and Alarm Features for CREF (Iodine Filtration) Train Subsystem.~~

10. Regulatory Guide 1.52, Revision 3, "Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Post-Accident Engineered-Safety-Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants," U.S. Nuclear Regulatory Commission, June 2001.

06.05.01-2

11. ERDA 76-21, "Nuclear Air Cleaning Handbook," Oak Ridge National Laboratory, 1976.

9.4 Air Conditioning, Heating, Cooling and Ventilation Systems

The heating, ventilation, and air-conditioning (HVAC) system for each major building or area is provided in the following subsections.

9.4.1 Main Control Room Air Conditioning System

The main control room air conditioning system (CRACS) is designed to maintain a controlled environment in the control room envelope (CRE) area for the comfort and safety of control room personnel and to support operability of the control room components during normal operation, anticipated operational occurrences and design basis accidents. CRACS is also relied upon to cope with and recover from a station blackout (SBO) event.

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Under normal operating conditions, the control room air conditioning system operates with fresh outside air (bypasses the control room emergency filtration (CREF) trains. The inlet air is pulled into the common recirculation plenum and mixes with air recirculated back from the rooms within the CRE. This mixture of outside air and recirculated air is pulled into the CRACS cooling units where it is filtered and cooled. The conditioned air is then supplied to CRE rooms. During a site radiological contamination event, the fresh air intake is redirected through the CREF iodine filtration trains. During an ~~CO, CO_2, smoke, or toxic gas~~outside fire or smoke event, the fresh air intake at the location of the alarm is manually isolated.

The main control room (MCR) habitability system, including the definition of the CRE area, is addressed in Section 6.4.

9.4.1.1 Design Bases

The CRACS is primarily a safety-related system with portions serving non-safety-related functions.

The safety-related portions are designed to Seismic Category I criteria requirements.

The non-safety-related portions of the CRACS are the restroom/kitchen exhaust fan, and smoke detectors.

The U.S. EPR meets:

- GDC 2, as it relates to meeting the guidance of RG 1.29 (position C.1 for the safety-related portions of the CRACS and position C.2 for those non-safety-related portions of which failure could reduce the functioning of any safety-related or Seismic Category I system components to an unacceptable safety level). The CRACS components are located inside the Safeguard Building (SB) divisions two and three. These buildings are designed to withstand the effect of natural phenomena, such as earthquake, tornados, hurricanes, floods, and external missiles

- GDC 4, as it relates to the CRACS by design, to protect against adverse environmental conditions and dynamic effects. The CRACS accommodates the effects of, and is compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents.

- GDC 5, as it relates to the CRACS system because safety-related components are not shared with any other nuclear power units.

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- GDC 19, as it relates to the CRACS system to provide adequate protection against radiation releases and outside fire or smoke eventsand hazardous chemical releases to permit access to and occupancy of the control room under accident conditions. The control room occupancy protection requirements meet the guidance of RG 1.78. RG 1.52 and 1.140 (GDC 60). In case of an alarm from the inlet air radiation monitors (refer to Section 11.5.3.1.1 and Table 11.5-1, Monitors R-29 and R-30), the CRACS directs the air intake automatically through activated carbon filtration beds. The air from CRE areas can also be recirculated through the same activated carbon filtration beds. The evaluation of potential toxic chemical accidents is addressed by the COL applicant in Section 2.2.3 and includes the identification of toxic chemicals. As described in Section 6.4.1, the COL applicant evaluates the impact of toxic chemical accidents on control room habitability in accordance with RG 1.78.

- GDC 60, as it relates to the release of radioactive materials to the environment.

Consideration of the environmental and dynamic effects of internal and external missiles and postulated piping failures on the CRACS is addressed in Section 3.5.1.1, Section 3.5.2, and Section 3.6.1.

Capability for withstanding or coping with a SBO event is provided to comply with the requirements of 10CFR 50.63. Acceptance is based on meeting the applicable guidance of RG 1.155, including position C.3.2.4. Refer to Section 8.4 for a description of the design features to cope with the SBO event.

The CRACS maintains habitability of the CRE areas during a site radiological contamination event or toxic contamination of the environment (Refer to Section 6.4).

During a postulated event, the control room is maintained at a minimum positive pressure of 0.125 inches water gauge relative to the surrounding environment to prevent uncontrolled incoming leakage.

During normal operation, the control room is maintained at a minimum positive pressure above ambientof 0.01 inches water gauge relative to the surrounding environment.

The CRACS maintains system performance in the event of failure of a single active safety-related component.

06.04-7

The CRACS outside air intake is capable of detecting radiation, toxic gases (which include CO, CO_2) (see Section 6.4.2.4), and smoke. Associated monitors actuate alarms in the MCR. Upon receipt of a containment isolation signal, or high radiation alarm signal in the outside air intake duct (Monitors R-29 and R-30, Table 11.5-1), the CREF (iodine filtration) train starts automatically and the outside air and CRE recirculation air are automatically diverted through the CREF (iodine filtration) train. The outside makeup air maintains a positive pressure inside the CRE area relative to the adjacent areas. The CRE air inlet and recirculation dampers operate automatically.

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Upon receipt of a toxic gas alarm from a toxic gas sensor in the outside air intake duct, the CREF (iodine filtration) trains are placed in the filtered alignment mode and the CRE air is diverted to the recirculation mode on both trains. The outside air inlet isolation damper at the outside inlet in alarm will be closed by the control room operator.

The CRACS is capable of isolating all non-safety-related system penetrations of the CRE boundary so that occupation and habitability of the control room is not compromised.

Air conditioning and heating loads for the CRE rooms is calculated using methodology identified in ASHRAE Handbook (Reference 8) as follows:

- Summer air conditioning loads are calculated with a maximum outside air design temperature 0 percent exceedance value, using U.S. EPR Site Design Envelope temperature (See Table 2.1-1). The analysis is completed for both a normal and accident plant alignment configuration.
- The CRACS cooling supply units are designed to provide cooling as required to prevent the CRE room temperatures from exceeding their maximum design temperature.
- Winter heating loads are calculated with the plant operating in an outage alignment configuration. Winter heat loads are calculated with a minimum outside air design temperature 0 percent exceedance value, using U.S. EPR Site Design Envelope temperature (See Table 2.1-1).

The CRACS supply air duct heaters are designed to operate for “comfort conditions only” as required when the CRE room temperature is less than the minimum “comfort temperature” set point value. The CRACS supply air duct heaters are not required to operate during accident conditions.

The CRACS maintains the following temperature ranges for the areas serviced:

Room	Temperature	Humidity
– Main Control Room:	68°F to 78°F	30 – 60%

–	I&C Computer Rooms, Rest Rooms:	65°F to 78°F	30 – 60%
–	HVAC Rooms:	50°F to 95°F	30 – 60%
–	Other areas of CRE:	65°F to 7978°F	20 – 80%

9.4.1.2 System Description

9.4.1.2.1 General Description

The CRACS is designed to maintain acceptable ambient conditions inside the CRE areas to provide for proper operation of equipment and for personnel access to conduct inspection, testing and maintenance. The CRE area is shown in Figures 6.4-1 through 6.4-3.

The CRACS consists of following subsystems:

- Air intake.
- ICREF (iodine filtration) train.
- RAir conditioning and recirculation air handling.
- CRE air supply and recirculation.
- Kitchen and restrooms exhaust.

Refer to Section 12.3.6.5.6 for ventilation system design features which demonstrate compliance with the requirements of 10 CFR 20.1406.

Air Intake Subsystem

The air intake subsystem is illustrated in Figure 9.4.1-1—Control Room Air Intake and CREF (Iodine Filtration) Train Subsystem.

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The control room air conditioning systemCRACS has two outside air intakes. The train 1 intake is located in Safeguard Building 2 and the train 4 intake is located in Safeguard Building 3. Outside air is supplied by each outside air intake through a wire mesh grille. Each outside air intake is equipped with an electrically heated, weather protected grille to prevent ice formation. A sensor is installed in each outside air intake to protect against toxic gas (refer to Section 6.4.2.4), while sSmoke detectors and radiation monitors (refer to Section 11.5.3.1.11 and Table 11.5-1, Monitors R-29 and R-30) are installed in the outside air intake ducting.

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Outside air intakes on each train isare interconnected through ducting to allow the outside inlet air to travel through a CREF iodine filtration unit (filtered alignment), or the outside air can bypass the CREF iodine filtration unit (unfiltered bypass alignment).

operation compared to operation during accident conditions. Each train of the CRACS is equipped with a pressure control damper. This damper will open and close as required to increase or decrease the amount of outside air that enters the control room. During normal operation, air is exhausted from the restrooms and the kitchen area through a small throttle damper that minimizes the open CRE boundary area.

Abnormal Operating Conditions

Redundancy of air supply and air conditioning trains is provided. A loss of function or power to any single train or component does not affect overall system operation. The train separation and independent power source limit common mode failure of active multiple trains and abnormal operating conditions.

Loss of a single CRACS air conditioning train will not result in a loss of system functional capability because only two of the four cooling trains are required to operate for both normal and accident operation. The CREF (iodine filtration) trains do not operate during normal plant operation, but loss of a single CREF (iodine filtration) train during any design basis accident will not result in a loss of iodine filtration capability because two CREF (iodine filtration) trains are provided.

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~~Upon detection of toxic gas at one of the outside air intakes, the CREF (iodine filtration) trains are automatically placed in the filtered alignment mode. The outside air inlet where toxic gas is detected is closed by an operator from the MCR. (refer to Section 6.4.2.2).~~

Loss of Offsite Power

During loss of offsite power (LOOP), the air intake and air conditioning and recirculation air handling electrical components located inside SB division two receive power for one train from the emergency diesel generators (EDG) of division two, and for the other train from the EDGs of division one. The electrical components located inside the SB division three receive power on one train from the EDGs of division three, and for the other train from the EDGs of division four.

During LOOP, the CREF (iodine filtration) train electrical components located inside the SB division two receive power from the EDGs of division one. The electrical components located inside the SB division three receive power from the EDGs of division four.

Station Blackout

- In the event of station blackout (SBO), the electrical components which receive power from the EDG of division one are backed-up by alternate AC (AAC) power from the SBO diesel generators (SBODG) of division one. The electrical components which receive power from the EDG of division four are backed up by the AAC power from the SBODGs of division four.

- In the event of a simultaneous SBO and site radiological event, the CRE area is isolated and CRACS is maintained in a full recirculation mode through the CREF (iodine filtration) train until site power is restored or EDGs are started. Power restoration is assumed to occur within eight hours following the occurrence of a SBO event.

Loss of Ultimate Heat Sink

The conditioned air supply is cooled by chilled water provided by the SCWS. Two water-cooled chillers are located in SB divisions two and three, and two air-cooled chillers are located in SB divisions one and four. In case of loss of ultimate heat sink (LUHS), the water-cooled chillers are not available. The safety chilled water is then supplied by air-cooled chillers which provide the cooling function for the filtration trains located in divisions one and four, which also include both CREF (iodine filtration) trains. The cooling function for any two of the four CRACS cooling units in divisions 1, 2, 3, and 4 will continue to be available.

Operation During Radiological Site Contamination

During a site radiological contamination event, the fresh air supply is automatically redirected through the CREF (iodine filtration) trains, instead of the normal intake air supply, by closing and opening the associated dampers. When one CREF (iodine filtration) train operates, the outside fresh airflow rate of 1000 cfm and CRE recirculation airflow rate of 3000 cfm (a total flow rate of 4000 cfm) provides an unlimited stay by the CRE personnel.

Exhaust from the kitchen and restrooms is stopped and all other exhaust air is recirculated.

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The operation of CRACS creates an minimum ~~positive~~ pressure of 0.125 inches of water gauge inside the CRE area with respect to the surrounding area. This limits unfiltered incoming air leakage into these areas.

~~*Operation During a Toxic Gas Event*~~

~~Outside air is continuously monitored for toxic gas (including CO and CO_2) by the toxic gas sensors located at the outside air intakes. Upon detection of a toxic gas condition, audible and visual alarms are actuated in the MCR. The CREF (iodine filtration) units on both intakes are automatically placed in the filtered alignment. The outside air intake (at the inlet location where the toxic gas is detected) will be closed by the control room operator.~~

Operation During External Fire or Smoke Release

In the event of external fire or smoke, the outside inlet isolation damper (at the inlet location where smoke is detected) is closed manually from the control room. The filtration and adsorption unit heaters are tested in accordance with ASME N510 (Reference 3).

In-service test program requirements, including the unfiltered in-leakage into the CRE testing will be performed per RG 1.197 (Reference 14) and ASTM E741-2000 (Reference 15).

Periodic testing and inspections identify systems and components requiring corrective maintenance, and plant maintenance programs correct deficiencies.

In-service test program and test frequency requirements are described in Chapter 16, "Technical Specification" Sections 3.7.10, 3.7.11 and per Ventilation Filter Test Program (VFTP) described in Chapter 16, "Technical Specification" Section 5.5.10.

Refer to Section 14.2 (test abstracts #082 and #203) for initial plant testing. Initial inplace acceptance testing of the CRACS components is performed in accordance with Reference 1 and Reference 3.

Periodic testing will be performed to verify the unfiltered in-leakage into the CRE area per RG 1.197.

Refer to Section 16 (SR 3.7.10 and SR 3.7.11) for surveillance requirements.

9.4.1.5 Instrumentation Requirements

Indication of the operational status of the equipment, position of dampers, and instrument indications and alarms are provided in the MCR. Fans, motor-operated dampers, heaters and cooling units are operable from the MCR. Local instruments are provided to monitor flow, temperature and pressure. The fire detection and sensor information are delivered to the fire detection system (refer to Section 9.5.1).

06.05.01-4

The minimum instrumentation, indication and alarms for CREF (iodine filtration) train subsystemESF filter system are provided in Table 9.4.1-1 per the requirements of ASME N509 (Reference 16)..

9.4.1.6 References

1. ASME AG-1-2003, "Code on Nuclear Air and Gas Treatment," The American Society of Mechanical Engineers, 20031997 (including the AG-1a, -20042000 "Housings" Addenda).

2. ANSI/ASHRAE Standard 52.2-1999, "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size," American Society of Heating, Refrigerating and Air Conditioning Engineers, 1999.

3. ASME N510-1989 (R1995), "Testing of Nuclear Air-Treatment Systems," The American Society of Mechanical Engineers, 1989.

Next File

06.05.01-4

Table 9.4.1-1—Minimum Instrumentation, Indication, and Alarm Features for CREF (Iodine Filtration) Train Subsystem

Sensing Location	Local Indication/Alarm	MCR Indication/Alarm
Inlet Outside Air	Radiation Indication	Radiation Indication / High Radiation Alarm
Unit Inlet Moisture Separator	Pressure Drop Indication	
Electric Heater Inlet	Temperature Indication	
Electric Heater	Status Indication	Status Indication
Electric Heater Outlet	Temperature Indication	Temperature Indication / High Temperature Alarm
Prefilter	Pressure Drop Indication / High Alarm	
Upstream-HEPA	Pressure Drop Indication / High Alarm	
Adsorber	Pressure Drop Indication / High Alarm	
Adsorber Outlet	Temperature Indication	Temperature Indication / High Temperature Alarm
Post-filter	Pressure Drop Indication / High Alarm	
System Filters Inlet to Outlet		Summation of pressure drop across entire filtration train (Indication / High Pressure Drop Alarm)
Fan	Pressure Drop Indication	Handswitch / Status Indication
Damper / Operator	Position Indication	Position Indication
Unit Outlet	Flow Rate Indication	Flow Rate (recorded indication, high alarm signal)
Unit inlet or outlet	Flow rate (indication)	Flow rate (recorded indication, high and low alarm signals)
Unit inlet	Radiation indication	Radiation indication / alarm
Unit inlet	Temperature indication	Temperature indication
Electric heater	On/Off indication	On/Off indication
Electric heater inlet	Temperature indication	Temperature indication /alarm
Electric heater outlet	Temperature indication	Temperature indication / alarm
Prefilter	Pressure drop (indication / high alarm signal)	
Upstream HEPA	Pressure drop (indication / high alarm signal)	

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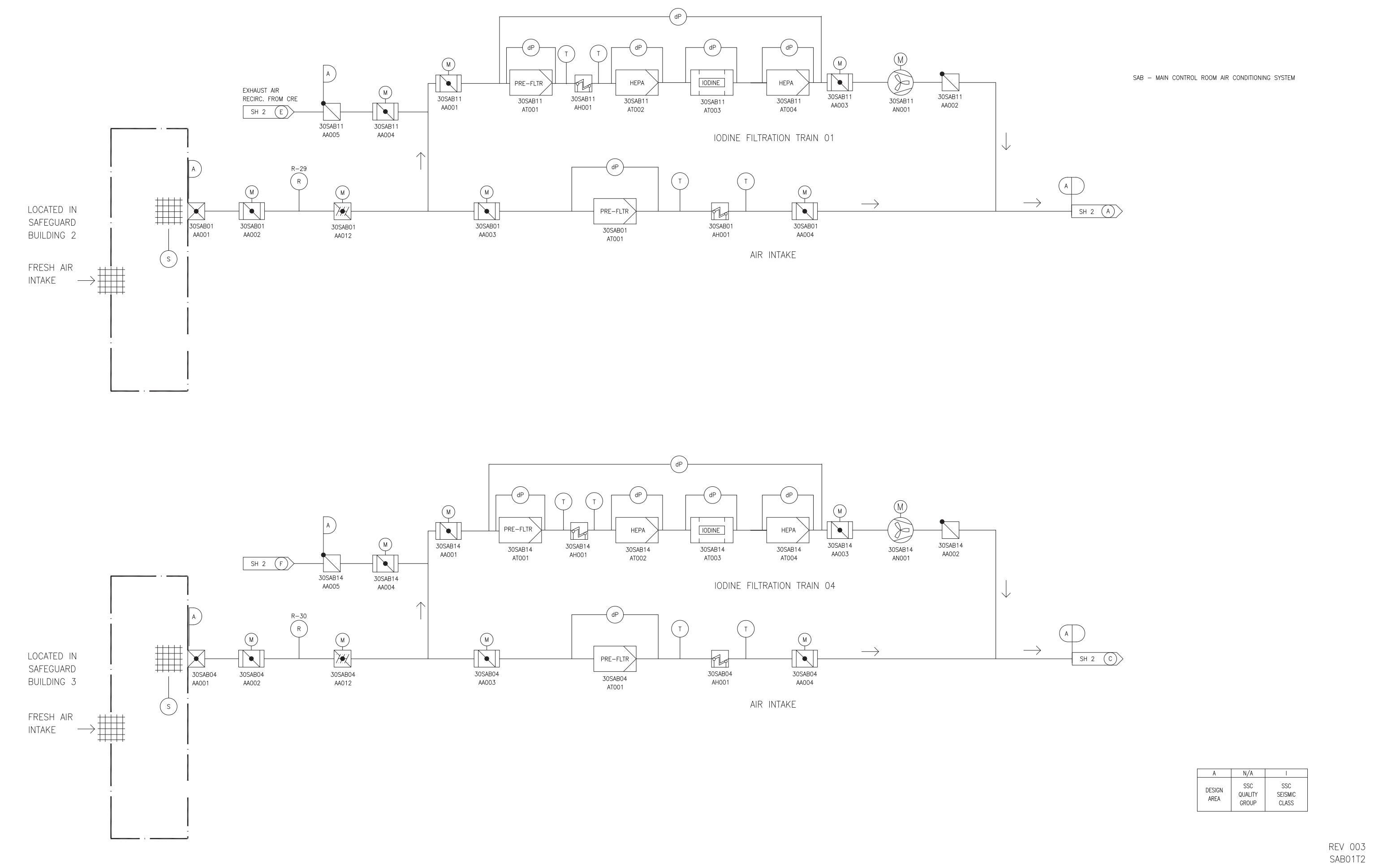
Table 9.4.1-1—Minimum Instrumentation, Indication, and Alarm Features for CREF (Iodine Filtration) Train Subsystem

~~Adsorber~~	~~Pressure drop (indication / high alarm signal)~~	
~~Downstream HEPA~~	~~Pressure drop (indication / high alarm signal~~	
~~System Filters inlet to outlet~~		~~Summation of pressure drop across entire filtration train (indication / high alarm signal~~
~~Fan~~		~~Hand switch, status indication~~
~~Damper/Operator~~		~~Status indication~~
~~Unit outlet~~	~~Temperature indication~~	~~Temperature indication~~

Figure 9.4.1-1—Control Room Air Intake and CREF (Iodine Filtration) Train Subsystem

06.04-7



Housings and ductwork are leak-tested in accordance with the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) technical manual "HVAC Air Duct Leakage Test Manual" (Reference 14), American Society of Mechanical Engineers, ASME N510 (Reference 4), ASME AG-1 (Reference 2), and RG 1.52 (Reference 10).

Emergency filtration units are tested by manufacturer for housing leakage, filter bypass leakage and airflow performance. Periodically and subsequent to each filter or adsorber material replacement, the unit is inspected and tested in-place in accordance with the requirements of RG 1.52 (Reference 10), ASME N510 (Reference 4) and ASME AG-1 (Reference 2). The charcoal adsorber samples are tested for efficiency in accordance with RG 1.52 (Reference 10) and ASTM D3803 (Reference 15). Air filtration and adsorption unit heaters are tested in accordance with ASME N510 (Reference 4).

Periodic testing and inspections identify systems and components requiring corrective maintenance, and plant maintenance programs correct deficiencies.

In-service test program and test frequency requirements are described in Section 16, "Technical Specification" Subsection 3.7.12 and per Ventilation Filter Test Program (VFTP) described in Section 16, "Technical Specification" Subsection 5.5.10.

Refer to Section 14.2 (test abstracts #083 and #203) for initial plant startup test program. Initial inplace acceptance testing of SBVS components is performed in accordance with Reference 2, and Reference 4.

Refer to Section 16 (SR 3.7.12) for surveillance requirements.

9.4.5.5 Instrumentation Requirements

Indication of the operational status of the equipment, position of dampers, instrument indications and alarms are provided in the MCR. Fans, motor-operated dampers, heaters and cooling units are operable from the MCR. Local instruments are provided to measure differential pressure across filters, flow, temperature and pressure. The fire detection and sensors information is delivered to the fire detection system. The radiation instrumentation requirements for controlling airborne radioactivity releases via the plant stack are addressed in Section 11.5Section 11.5.3.1.9 and Table 11.5-1, Monitor R-25.

06.05.01-4

The minimum instrumentation, indication and alarms for the SBVS ESF filter systems are provided in Table 9.4.5-1 per the requirements of ASME N509 (Reference 9).

Table 9.4.5-1—Minimum Instrumentation, Indication and Alarm Features for SBVS (Accident Iodine Exhaust Filtration Trains)

Sensing Location	Local Indication/Alarm	MCR Indication/Alarm
Unit Inlet Moisture Separator	Pressure Drop Indication	
Electric Heater Inlet	Temperature Indication	
Electric Heater	Status Indication	Status Indication
Electric Heater Outlet	Temperature Indication	Temperature Indication / High Temperature Alarm
Prefilter	Pressure Drop Indication / High Alarm	
Upstream-HEPA	Pressure Drop Indication / High Alarm	
Adsorber	Pressure Drop Indication / High Alarm	
Adsorber Outlet	Temperature Indication	Temperature Indication / High Temperature Alarm
Post-filter	Pressure Drop Indication / High Alarm	
System Filters Inlet to Outlet		Summation of pressure drop across entire filtration train (Indication / High Pressure Drop Alarm)
Fan	Pressure Drop Indication	Handswitch / Status Indication
Damper / Operator	Position Indication	Position Indication
Unit Outlet	Flow Rate Indication	Flow Rate (recorded indication, high alarm signal)
Unit Outlet	Radiation Indication	Radiation Indication / High Radiation Alarm

06.05.01-4

9.4.7.5 Instrumentation Requirements

Indication of the operational status of the equipment, position of dampers, instrument indications and alarms are provided in the main control room (MCR). Fans, motor-operated dampers, heaters and cooling units are operable from the MCR. Local instruments are provided to measure differential pressure across filters, flow, temperature and pressure. The fire detection and sensors information is delivered to the fire detection system.

06.05.01-4

The minimum instrumentation, indication and alarms for CBVS ESF filter systems are provided in Table 9.4.7-1 per the requirements of ASME N509 (Reference 15).

The radiation instrumentation requirements for controlling airborne radioactivity releases via the plant stack are addressed in Section 11.5Sections 11.5.3.1.4, 11.5.3.1.5, Section 11.5.4.8, and Table 11.5-1, Monitors R-7 and R-8 (Low Purge Subsystem) and R-10 (Internal Filtration Subsystem).

9.4.7.6 References

1. ASME AG-1-2003, "Code on Nuclear Air and Gas Treatment," The American Society of Mechanical Engineers, 20031997 (including the AG-1a, 20042000, "Housings" Addenda).

2. ANSI/ASHRAE Standard 52.2-1999, "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size," ANSI/American Society of Heating, Refrigerating and Air Conditioning Engineers, 1999.

3. ASME N510-1989 (R1995), "Testing of Nuclear Air-Treatment Systems," The American Society of Mechanical Engineers, 1989.

4. ANSI/AMCA-210-99, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating," American National Standards Institute/Air Movement and Control Association International, December 1999.

5. ANSI/AMCA-211-1987, "Certified Ratings Program–Air Performance," American National Standards Institute/Air Movement and Control Association International, 1987.

6. ANSI/AMCA-300-1985, "Reverberant Room Method of Testing Fans for Rating Purposes," American National Standards Institute/Air Movement and Control Association International, 1985.

7. UL 555, "Standard for Fire Dampers," Underwriter's Laboratories, Sixth Edition, June 1999.

8. NUREG-0800, BTP 6-4, Revision 3, "Containment Purging During Normal Plant Operations," U.S. Nuclear Regulatory Commission, March 2007.

Table 9.4.7-1—Minimum Instrumentation, Indication and Alarm Features for CBVS (Low-Flow Purge Exhaust Subsystem)

Sensing Location	Local Indication / Alarm	MCR Indication / Alarm
Unit Inlet Moisture Separator	Pressure Drop Indication	
Electric Heater Inlet	Temperature Indication	
Electric Heater	Status Indication	Status Indication
Electric Heater Outlet	Temperature Indication	Temperature Indication / High Temperature Alarm
Prefilter	Pressure Drop Indication / High Alarm	
Upstream-HEPA	Pressure Drop Indication / High Alarm	
Adsorber	Pressure Drop Indication / High Alarm	
Adsorber Outlet	Temperature Indication	Temperature Indication / High Temperature Alarm
Post-filter	Pressure Drop Indication / High Alarm	
System Filters Inlet to Outlet		Summation of pressure drop across entire filtration train (Indication / High Pressure Drop Alarm)
Fan	Pressure Drop Indication	Handswitch / Status Indication
Damper / Operator	Position Indication	Position Indication
Unit Outlet	Flow Rate Indication	Flow Rate (recorded indication, high alarm signal)
Unit Outlet	Radiation Indication	Radiation Indication / High Radiation Alarm

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The HVAC systems ventilate, exhaust, or isolate fire areas under fire conditions so that products of combustion do not spread to other fire areas. Ducts penetrating through fire area boundaries are provided with automatic fire dampers that have a fire rating equivalent to the rating of the barrier, or the ducts have a fire rating equivalent to the rating of the barrier and have no openings. Dampers are designed and tested to provide reasonable assurance of their operability under airflow conditions. Where practical, ventilation power and control cables for mechanical ventilation systems are located outside of the fire area served by the systems. Fresh air supply intakes to areas containing equipment or systems important to safety are located remote from the exhaust outlets and smoke vents of other fire areas to minimize the possibility of contaminating the intake air with products of combustion.

The release of smoke and gases, containing radioactive materials, to the environment is monitored in accordance with RG 1.101. Where possible, isolation is provided where the release of smoke and gases could contain radioactive materials in a fire condition. However, where venting is required, filtration equipment used to reduce doses is designed or protected to withstand the smoke and heat resulting from the fire. Ventilation systems designed to exhaust potentially radioactive smoke or gases have been evaluated to make sure that inadvertent operation or single failures do not violate the radiologically controlled areas.

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Plant operations staff is protected from the effects of fire and fire suppression (e.g., gaseous suppression agents) to provide reasonable assurance of safe shutdown of the plant including operator manual actions. The arrangement of the MCR, egress pathways and the RSS provides habitability in these areas. During normal operation and for a radiological event, the MCR is maintained at positive pressure with respect to ~~the outside and~~ adjacent areas. ~~The design of the HVAC system places the MCR in recirculation mode for a fire outside the MCR~~Upon receipt of a smoke detection alarm (detector located in the outside air inlet), the outside air inlet isolation damper located at the detector is placed in the closed position so that any fires in these outside and adjacent areas will not affect the habitability of the MCR. Upon receipt of a smoke detection alarm (detector located at the discharge of one of the CRACS recirculation cooling units), the respective CRACS recirculation cooling unit is shut down from the MCR and the fire dampers automatically close (fuse link) to provide isolation. Smoke and heat removal throughout the facility is provided by portable systems or by manual operation of the non-safety-related HVAC systems.

A smoke confinement system (SCS) Nuclear Island (NI) is provided to ~~ensure~~ maintain habitability of the select egress paths between the MCR and RSS. See Section 9.4.13 for a detail description and operation of the SCS. The design of the smoke confinement systems complies with NFPA 92A (Reference 17) and NFPA 204 (Reference 19). Egress pathways are maintained at higher pressure than adjacent areas to minimize smoke infiltration during a fire.

Although the control room envelope is considered to be a nonradioactive area, radiation protection is provided to maintain radiological habitability during design basis accidents (refer to Sections 9.4.1 and 6.4).

12.3.3.3 Protective Design Features

The following protective design features are used to accomplish the HVAC design objectives.

- For radiological areas, airflow within the area is from areas of low potential radioactivity to those of higher potential radioactivity.
- HVAC systems serving potentially contaminated areas maintain the area under negative pressure with respect to adjacent cleaner areas. Infiltration and leakage into the area is considered when sizing the system.
- Positive pressure is maintained in the MCR to prevent uncontrolled in-leakage of airborne radioactivity.
- Ventilating air is recirculated in the clean (uncontaminated) areas only.
- Removal of airborne radioactive iodine and radioactive particulates from the air stream prior to release to the environment, or means are provided to isolate these areas upon indication of contamination to minimize the discharge of these types of contaminants to the environment.

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- Drains from ESF filter system moisture separators are routed to the nuclear island drain and vent system (NIDVS) which handles potentially contaminated liquids.
- Suitable containment isolation valves are installed in accordance with 10 CFR 50, Appendix A, GDC 54 and 56, including valve controls, to make certain that the containment integrity is maintained (refer to the description in Section 6.2.4).
- The NI vent and drain systems are connected directly to the ventilation systems rather than being vented to containment spaces.
- Access and service of ventilation systems in potentially radioactive areas is controlled by component location to minimize personnel exposure during maintenance, inspection, and testing.
- Maintenance for carbon filters is performed by special machines that remove any charcoal dust during recharging of the filters.
- The air cleaning system design, maintenance, and testing criteria are designed in accordance with the regulatory criteria contained in RG 1.52 (postaccident engineered safety feature atmospheric cleanup system) and RG 1.140 (normal atmospheric cleanup systems).

3.3 Verify in manual operating mode that system rated air flow and air balance meet design requirements.

3.4 Demonstrate in automatic mode the transfer to emergency-operations as a result of the following:

3.4.1 Detection of radiation in one of the outside inlets places the CREF (iodine filtration) units in the filtered alignment.

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3.4.2 ~~Detection of toxic gas (which includes CO, or CO2) in one of the outside air inlets will close inlet isolation dampers at that inlet.~~

3.4.3 Safety injection actuation/primary containment isolation signal.

3.5 Verify the HEPA filter efficiency, carbon adsorber efficiency, and filter bank air flow capacity.

3.6 Verify that operation of protective devices, controls, interlocks, instrumentation, and alarms using actual or simulated inputs meets design requirements.

3.7 Verify that the system maintains the CRE at the required positive pressure relative to the outside atmosphere during system operation.

3.8 ~~Verify the isolation capability of the CRE on detection of toxic gas at the intakes meets the requirements of RG 1.78.~~

3.9 Demonstrate the operation of the battery room exhaust fans.

3.10 Verify the CRE air in-leakage rate when aligned in the emergency mode.

3.11 Verify that operation of CRACS in response to radiation monitors meets design requirements (refer to Table 11.5-1, Monitors R-29 and R-30).

3.12 Check electrical independence and redundancy of power supplies for safety-related functions by selectively removing power and determining loss of function.

4.0 DATA REQUIRED

4.1 Air balancing verification.

4.2 Fan and damper operating data.

4.3 Temperature data in the CRE.

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4.4 Response to radioactivity~~, toxic gas (including CO, or CO_2),~~ and smoke.

4.5 Setpoints of alarms, interlocks, and controls.

4.6 Pressurization data for the CRE.

4.7 Filter and carbon adsorber data.

4.8 CRE in-leakage rate when aligned in the emergency mode.

4.9 The CRACS response to radiation monitors.

5.0 ACCEPTANCE CRITERIA

5.1 The CRACS operates as designed (refer to Section 9.4.1).

5.1.1 CRACS alarms, interlocks, and controls (manual and automatic) function as designed.

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5.1.2 CRACS valves and dampers function as design.

5.1.3 CRACS responds as designed to a simulated ~~toxic gas (including CO, or CO_2) and~~ smoke.signal.

5.1.4 CRACS recirculation flow rate meets design requirements.

- Table 14.3-2 Item 2-7.

5.1.5 CRACS unfiltered air in-leakage rate while in recirculation mode meets design requirements.

- Table 14.3-2 Item 2-8.

5.1.6 CRACS is capable of generating a positive MCR pressure relative to adjacent areas, as designed.

- Table 14.3-2 Item 2-6.

5.1.7 CRACS responds as designed to a simulated SIS signal.

- Table 14.3-2 Item 2-5.

5.2 The CRACS radiation monitors perform as designed (refer to ~~Section 9.4.1~~Table 11.5-1, Monitors R-29 and R-30):

5.2.1 CRACS responds as designed to a simulated high radiation signal.

- Table 11.5-1, Monitors R-29 and R-30.
- Table 14.3-2 Item 2-5.

5.3 Verify that safety-related components meet electrical independence and redundancy requirements.

14.2.12.8.11 Safeguard Building Controlled Area Ventilation System (Test #083)

1.0 OBJECTIVE

1.1 To demonstrate the operation of the safeguard building controlled area ventilation system (SBVS):

1.1.1 Hot mechanical area serviced by the SBVS.

1.1.2 SBVS air supply subsystem.

1.1.3 SBVS air exhaust subsystem.

1.1.4 Electric air heating convectors (area heaters).

1.2 To demonstrate electrical independence and redundancy of power supplies.

Table 14.3-2—Radiological Analysis (Safety-Significant Features)
Sheet 1 of 2

Item #	Tier 2 Reference	Design Feature	Value
2-1	Section 6.2.3	The annulus ventilation system provides a sub-atmospheric pressure between the inner and outer containment shells during postulated accidents.	~~At least~~≤ -0.25 inches of ~~H_2O~~water gauge in ≤ 305 s from initiation of signal
2-2	Section 6.2.6.1	Leakage rate (L_a) through the primary containment.	≤ 0.25 w/o per day
2-3	Section 6.3.2.2	Post LOCA pH control ≥7 is provided for the in-containment refueling water storage tank (IRWST) with TSP-dodecahydrate.	≥12,200 lb_m TSP
2-4	Section 9.1.2	The spent fuel pool water level is maintained above the spent fuel.	≥23 feet
2-5	Sections 9.4.1.1, 9.4.1.2.3, and 15.0.3.4.1	Outside air supply to the main control room (MCR) is diverted to filtration system upon actuation by a primary containment isolation signal or by high radiation levels in the air intake ducts.	≤ 1 minute
2-6	Section 9.4.1.2.3	Filtered outside air supply to the MCR is sufficient to maintain a positive pressure relative to areas outside the MCR pressure boundary.	≥1/8 inch water gauge
2-7	Section 9.4.1.2.3	The MCR post-isolation ventilation recirculation system diverts air through a filtration system.	≥ 3000 cfm
2-8	Section 15.0.3.4.1	MCR ventilation unfiltered air inleakage.	≤ 50 cfm (40 cfm boundary leakage plus 10 cfm ingress and egress leakage)
2-9	Sections 9.4.2, 9.4.3, 9.4.5, 9.4.8, and 9.4.14	The Fuel Building and the radiological controlled area of safeguard building ventilation systems maintain negative pressure in the buildings with respect to the outside atmosphere, to prevent leakage of potentially contaminated air to the environment.	≤ -0.25 inches of water gauge
2-10	Section 15.0.3.11.2	Closure time for containment isolation valves for pre-isolation filtered exhaust (KLA system).	≤ 10 s
2-11	Section 12.3.2.3	Building wall thicknesses for the Reactor Building and annulus (UJA) provide shielding to meet the radiation zone and access requirements for postaccident mitigation.	

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3.6 CONTAINMENT SYSTEMS

3.6.6 Shield Building

LCO 3.6.6 The Shield Building shall be OPERABLE.

--NOTE--
The Shield Building envelope may be opened intermittently under administrative control.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Shield Building inoperable.	A.1 Restore Shield Building to OPERABLE status.	24 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	6 hours
	AND	
	B.2 Be in MODE 5.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.6.1	Verify annulus ~~negative~~ pressure is ≤≥ -0.25 inches water gauge.	12 hours

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SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.6.2	Verify each Shield Building access door is closed, except when the access opening is being used for entry and exit.	31 days
SR 3.6.6.3	Verify the annulus pressure can be drawn down to ~~a pressure equal to or more negative than~~≤ ~~-~~-0.25 inches water gauge using one Annulus Ventilation System (AVS) train in ≤ 305 seconds after a start signal.	24 months on a STAGGERED TEST BASIS for each AVS train
SR 3.6.6.4 06.04-7	Verify the annulus pressure can be maintained at ~~a pressure equal to or more negative than~~ ≤ -0.25 inches water gauge by one AVS train at a flow rate of ≤ 1295 cfm.	24 months on a STAGGERED TEST BASIS for each AVS train
SR 3.6.6.5	Verify Shield Building structural integrity by performing a visual inspection of the exposed interior and exterior surfaces of the Shield Building.	During shutdown for SR 3.6.1.1 Type A tests

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.7.1	Operate each AVS accident filtration train for ≥ 15 minutes with heaters energized ~~operating~~. 06.04-7	31 days
SR 3.6.7.2	Perform required AVS filter testing in accordance with the Ventilation Filter Testing Program (VFTP).	In accordance with the VFTP
SR 3.6.7.3	Verify each AVS accident filtration train actuates on an actual or simulated actuation signal.	24 months
SR 3.6.7.4	Verify that the normal operation train motor operated isolation dampers close on an actual or simulated isolation signal.	24 months

3.7 PLANT SYSTEMS

3.7.10 Control Room Emergency Filtration (CREF)

LCO 3.7.10 Two CREF trains shall be OPERABLE.

---NOTE---
The control room envelope (CRE) may be opened intermittently under administrative control.

APPLICABILITY: MODES 1, 2, 3, 4, 5, and 6,
During movement of irradiated fuel assemblies.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One CREF train inoperable ~~for reasons other than Condition B~~.	A.1 Restore CREF train to OPERABLE status.	7 days
B. The CRE boundary is inoperable ~~One or more CREF trains inoperable due to inoperable CRE boundary~~ in MODE 1, 2, 3, or 4.	B.1 Initiate action to implement mitigating actions. AND B.2 -----REVIEWER'S NOTE---- The need for the mitigating action for toxic gas isolation state will be determined by the COL applicant. ----------------------------------- Verify mitigating actions ensure CRE occupant exposures to radiological, [~~chemical~~toxic gas,] and smoke hazards will not exceed limits. AND	Immediately 24 hours 06.04-7

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
	B.3	Restore CRE boundary to OPERABLE status.	60 days
C. Required Action and associated Completion Time of Condition A or B not met in MODE 1, 2, 3, or 4.	C.1	Be in MODE 3.	6 hours
	AND		
	C.2	Be in MODE 5.	36 hours
D. Required Action and associated Completion Time of Condition A or B not met in MODE 5 or 6, or during movement of irradiated fuel assemblies.	D.1	-----REVIEWER'S NOTE---- The need for toxic gas isolation state will be determined by the COL applicant. -------------------------------------	
		[--------------NOTE------------- Place CREF train in toxic gas isolation state if automatic transfer to toxic gas isolation state is inoperable. ------------------------------------]	Immediately
		Place OPERABLE CREF train in emergency mode.	
	OR		
	D.2	Suspend movement of irradiated fuel assemblies.	Immediately

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ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
E. Two CREF trains inoperable in MODE 5 or 6, or during movement of irradiated fuel assemblies. OR ~~One or more CREF trains inoperable due to an inoperable CRE boundary~~ The CRE boundary is inoperable in MODE 5 or 6, or during movement of irradiated fuel assemblies.	E.1	Suspend movement of irradiated fuel assemblies.	Immediately
F. Two CREF trains inoperable in MODE 1, 2, 3, or 4 ~~for reasons other than Condition B~~.	F.1	Enter LCO 3.0.3.	Immediately

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SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.10.1 06.04-7	Operate each CREF train for ≥ 15 minutes with the heaters energizedoperating.	31 days
SR 3.7.10.2	Perform required CREF filter train testing in accordance with the Ventilation Filter Testing Program (VFTP).	In accordance with the VFTP
SR 3.7.10.3	Verify each CREF train actuates on an actual or simulated actuation signal.	24 months
SR 3.7.10.4	Perform required CRE unfiltered air inleakage testing in accordance with the Control Room Envelope Habitability Program.	In accordance with the Control Room Envelope Habitability Program

3.7 PLANT SYSTEMS

3.7.11 Main Control Room Air Conditioning System (CRACS)

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LCO 3.7.11 Four CRACS trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, 4, 5, and 6,
During movement of irradiated fuel assemblies.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One CRACS trains inoperable.	A.1	Restore CRACS train to OPERABLE status.	120 days
B. Two CRACS trains inoperable.	B.1	Restore one inoperable CRACS train to OPERABLE status.	30 days
C. Required Action and associated Completion Time of Condition A or B not met in MODE 1, 2, 3, or 4.	C.1	Be in MODE 3.	6 hours
	AND		
	C.2	Be in MODE 5.	36 hours
D. Required Action and associated Completion Time of Condition A or B not met in MODE 5 or 6, or during movement of irradiated fuel assemblies.	D.1	Place an OPERABLE CRACS train in operation.	Immediately
	OR		
	D.2	Suspend movement of irradiated fuel assemblies.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.12.1	Verify Safeguard Building controlled areas and Fuel Building negative pressure is ≤≥ -0.25 inches water gauge.	12 hours
SR 3.7.12.2	Verify each Safeguard Building controlled areas and Fuel Building access door is closed, except when the access opening is being used for entry and exit.	31 days
SR 3.7.12.3	Operate each SBVS accident exhaust filtration train for ≥ 15 minutes with the heaters operatingenergized.	31 days
SR 3.7.12.4	Perform required SBVS filter testing in accordance with the Ventilation Filter Testing Program (VFTP).	In accordance with the VFTP
SR 3.7.12.5	Verify each SBVS accident exhaust filtration train actuates on an actual or simulated actuation signal.	24 months
SR 3.7.12.6	Verify Safeguard Building controlled areas and Fuel Building pressure can be drawn down to a negative pressure ≥≤ -0.25 inches water gauge in ≤ 305 seconds after an start actual or simulated actuation signal using one SBVS accident exhaust filtration train.	24 months on a STAGGERED TEST BASIS for each SBVS accident exhaust filtration train
SR 3.7.12.7 06.04-7	Verify Safeguard Building controlled areas and Fuel Building pressure can be maintained at a negative pressure ≥ ≤ -0.25 inches water gauge using one SBVS accident exhaust filtration train at a flow rate of ≤ 2640 cfm.	24 months on a STAGGERED TEST BASIS for each SBVS accident exhaust filtration train

BASES

ACTIONS (continued)

B.1 and B.2

If the shield building cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.6.6.1

Verifying that shield building annulus negative pressure is within limit ensures that operation remains within the limit assumed in the containment analysis. The 12 hour Frequency of this SR was developed considering operating experience related to shield building annulus pressure variations and pressure instrument drift during the applicable MODES.

SR 3.6.6.2

Maintaining shield building OPERABILITY requires verifying each access opening door is closed. However, all shield building access doors are normally kept closed, except when the access opening is being used for entry and exit or when maintenance is being performed on an access opening. The 31 day Frequency of this SR is based on engineering judgment and is considered adequate in view of the other indications of door status that are available to the operator.

SR 3.6.6.3 and 3.6.6.4

The Annulus Ventilation System (AVS) exhausts the annulus atmosphere to the environment through appropriate treatment equipment. Each safety AVS train is designed to draw down the annulus to a ~~negative~~ pressure of ~~≥~~ ≤ -0.25 inches of water gauge (wg) in ≤ 305 seconds and maintain the annulus at a ~~negative~~ pressure ~~≥~~ ≤ -0.25 inches wg. To ensure

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BASES

SURVEILLANCE REQUIREMENTS (continued)

that all fission products released to the annulus are treated, SR 3.6.6.3 and SR 3.6.6.4 verify that a pressure in the annulus that is less than the lowest postulated pressure external to the shield building boundary can be established and maintained. When the AVS System is operating as designed, the establishment and maintenance of annulus pressure cannot be accomplished if the shield building boundary is not intact. Establishment of this pressure is confirmed by SR 3.6.6.3, which demonstrates that the annulus can be drawn down to a ~~negative~~ pressure of ~~≥~~ ≤ -0.25 inches wg using one AVS train. SR 3.6.6.4 demonstrates that the annulus can be maintained at a ~~negative~~ pressure of ~~≥~~ ≤ -0.25 inches wg using one AVS train at a flow rate ≤ 1295 cfm. The primary purpose of these SRs is to ensure annulus boundary integrity. The secondary purpose of these SRs is to ensure that the AVS train being tested functions as designed. There is a separate LCO with Surveillance Requirements which serves the primary purpose of ensuring OPERABILITY of the AVS System. These SRs need not be performed with each ~~safety~~ AVS train. The AVS train used for these Surveillances is staggered to ensure that in addition to the requirements of LCO 3.6.7, either safety AVS train will perform this test. The inoperability of the AVS System does not necessarily constitute a failure of these Surveillances relative to the shield building OPERABILITY. Operating experience has shown the shield building boundary usually passes these Surveillances when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

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SR 3.6.6.5

This SR would give advance indication of gross deterioration of the concrete structural integrity of the Shield Building. The Frequency of this SR is the same as that of SR 3.6.1.1. The verification is done during shutdown.

REFERENCES None.

B 3.6 CONTAINMENT SYSTEMS

B 3.6.7 Annulus Ventilation System (AVS)

BASES

BACKGROUND

The AVS is required by 10 CFR 50, Appendix A, GDC 41, "Containment Atmosphere Cleanup" (Ref. 1), to ensure that radioactive materials that leak from the Containment Building into the shield building (secondary containment) following a Design Basis Accident (DBA) are filtered and adsorbed prior to exhausting to the environment.

The Containment Building is surrounded by a secondary containment called the shield building, which is a concrete structure. Between the Containment Building and the shield building inner wall is an annular space that collects any containment leakage that may occur following a loss of coolant accident (LOCA). This space also allows for periodic inspection of the outer surface of the Containment Building.

The AVS maintains a negative pressure in the annulus between the shield building and the Containment Building during operation. Filters in the system control the release of radioactive contaminants to the environment. Shield building OPERABILITY is required to ensure retention of primary containment leakage and proper operation of the AVS. The AVS is designed to permit appropriate periodic pressure and functional testing to assure component integrity, OPERABILITY of active components, and operational performance of the system as required by GDC-43 "Testing of Containment Atmosphere Cleanup Systems" (Ref. 2).

The AVS consists of one normal operation filtration train (non-safety related), and two independent and redundant accident filtration trains (safety related). The normal filtration train operates during normal plant operation, including cold shutdown and outages. The normal operations
06.04-7 filtration train maintains a ~~negative~~ pressure ~~≥~~ of ≤ -0.25 inches water gauge in the annulus during normal operation. During normal plant operation, the accident filtration trains are not required to be in operation, however they are both available for back-up if the normal filtration train is not able to maintain sufficient negative pressure in the annulus.

BASES

BACKGROUND (continued)

During normal operation, the conditioned air is drawn from the Nuclear Auxiliary Building Ventilation supply shaft to the bottom of annulus through a fire damper, manual regulated control damper, and two motor operated isolation dampers. The exhaust air is drawn through a vent at the top of annulus through two motor operated isolation dampers and fire dampers to the Nuclear Auxiliary Building Ventilation System exhaust fans via air shaft cell 3. See FSAR Section 9.4.3 (Ref. 3). The exhaust air from cell 3 is monitored for radiation. If clean, the air is filtered by the pre-filter and HEPA filter and then discharged through the vent stack. If in alarm, the air is filtered by a prefilter, HEPA filter, carbon adsorber and a post-filter, and discharged through the vent stack. The annulus air inlet and exhaust motor operated isolation dampers of the normal filtration train are the only components which are safety related. The four safety-related class motor operated air tight dampers will isolate the annulus from the non-safety normal operation train in case of a design basis accident. The two isolation dampers in both the supply and exhaust train are powered by separate divisions and are supplied by the emergency diesel generators. Each isolation damper can be operated either automatically or manually from the Main Control Room.

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In normal operation mode, if there is a loss of negative pressure in the annulus, failure of the Nuclear Auxiliary Ventilation System, or Loss of Offsite Power, the normal operation filtration train is considered lost and one of the accident filtration trains is switched on. The two isolation dampers on both the normal supply and exhaust trains are closed and one of the two accident filtration trains is switched on. The other accident filtration train is available for backup.

The AVS accident filtration trains are used during a design basis event to contain leaks from the primary containment by maintaining a negative pressure in the annulus. During a design basis event, the annulus air is filtered before releasing to the environment. There are two independent 100% accident trains. Each train consists of an upstream air-tight motor controlled damper, electrical heater, pre-filter, upstream HEPA filter, an activated ~~charcoal~~ carbon adsorber for removal of radio-iodines, downstream HEPA filter, downstream air-tight motor controlled damper, fan, and back-draft damper. The upstream HEPA filter removes the fine discrete particulate matter from the air stream. The downstream HEPA filter following the ~~charcoal~~ carbon adsorber collects carbon particles and provides backup in case of failure of the upstream HEPA filter. Only the upstream HEPA filter and the ~~charcoal~~ carbon adsorber section are credited in the analysis.

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BASES

BACKGROUND (continued)

06.04-7 The system initiates and maintains a negative air pressure in the ~~Shield Building~~annulus by means of filtered exhaust ventilation of the Shield Building following receipt of a containment isolation signal. The system is described in Reference 4.

The prefilters remove large particles in the air to prevent excessive loading of the HEPA filters and ~~charcoal~~ carbon absorbers. Heaters reduce the relative humidity of the airstream to 70 percent or less. Monthly operation of each train, for ≥ 15 minutes, with heaters on, reduces moisture buildup on the HEPA filters and adsorbers. The heater operation time and monthly Frequency are consistent with Reference 6.

During normal operation, the AVS normal operation filtration train (non-safety related) maintains a negative pressure in the annulus and processes the air through HEPA filters.

The isolation dampers on the normal operation filtration train and the accident filtration trains can be operated either automatically or manually from the Main Control Room.

The AVS accident filtration train reduces the radioactive content in the shield building atmosphere following a DBA. Loss of the AVS could cause site boundary doses, in the event of a DBA, to exceed the values given in the licensing basis.

APPLICABLE SAFETY ANALYSES

The AVS design basis is to mitigate the consequences of the limiting DBA, which is a LOCA. The accident analysis (Ref. 5) assumes that only one train of the AVS is OPERABLE due to a single failure that disables the other train. The accident analysis accounts for the reduction in airborne radioactive material provided by the remaining one train of this filtration system. The amount of fission products available for release from containment is determined for a LOCA. For all events analyzed, the AVS is assumed to be automatically initiated to reduce via filtration and adsorption, the radioactive material released to the environment.

The modeled AVS actuation in the safety analyses is based upon a worst case response time following a containment isolation initiated at the limiting setpoint. The total response time, from exceeding the signal
06.04-7 setpoint to attaining ~~the negative~~a pressure of ≤ -0.25 inches wg in the ~~shield building~~annulus, is ≤ 305 seconds. This response time is composed of signal delay, diesel generator startup and sequencing time, system startup time, and time for the system to attain the required pressure after starting.

The AVS satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

BASES

ACTIONS (continued)

C.1 and C.2

If the AVS accident filtration train or isolation damper cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.6.7.1

Standby systems should be checked periodically to ensure that they function properly. As the environment and normal operating conditions on this system are not too severe, testing each train once every month provides an adequate check of this system. Monthly heater operations which dry out any moisture accumulated in the carbon from humidity in the ambient air should be performed. Each Iodine filtration train must be operated for ≥ 15 minutes with the heaters energized. The 31 day Frequency is based on the reliability of the equipment and the two train redundancy. The heater energization time and 31 day Frequency are consistent with Reference 6.

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SR 3.6.7.2

This SR verifies that the required AVS filter testing is performed in accordance with the Ventilation Filter Testing Program (VFTP). The VFTP includes testing HEPA filter performance, ~~charcoal~~ carbon adsorber efficiency, ~~minimum~~ system flow rate, and the physical properties of the activated ~~charcoal~~ carbon (general use and following specific operations). Specific test frequencies and additional information are discussed in detail in the VFTP.

B 3.7 PLANT SYSTEMS

B 3.7.9 Safety Chilled Water (SCW) System

BASES

BACKGROUND

The SCW System provides a heat sink for the removal of process and operating heat from safety related components during an anticipated operational occurrence (AOO) or postulated accident. During normal operation, and a normal shutdown, the SCW System also provides this function for the associated safety related systems. The safety related function is covered by this LCO.

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The SCW System consists of four ~~independent~~ trains. Each train consists of a chiller refrigeration unit ~~(three 50% compressors per unit)~~, chilled water pumps (two ~~100%~~ pumps), surge tank, piping, valving, and instrumentation. Normally open motor operated cross-tie valves interconnect the supply and return of Train 1 with Train 2 and interconnect the supply and return of Train 3 with Train 4. Each SCW System chiller is sized to meet the system load requirements of two divisional trains. Heat is rejected to the system chilled water as it passes through the cooling coils of the system users. This heat is rejected from the system as it is pumped through the train chiller refrigeration units. Trains 1 and 4 reject this energy to ambient via air cooled condensers while T~~t~~rains 2 and 3 have condensers cooled by the Component Cooling Water (CCW) System. Each refrigeration chiller in the four divisions of the SCWS ~~has three 50 percent capacity compressors to~~ provides sufficient operating redundancy and flexibility in the event of a compressor failure. ~~The two remaining chiller compressors provide 100 percent capacity.~~

During normal operation, at least one train of the divisional pair is in operation. Either Train 1 or Train 2 chiller provides safety chilled water cooling ~~for all SCW loads~~ within Safeguard Building Divisions 1 and 2, and the associated Fuel Building Ventilation System (FBVS) load. Likewise, the chiller from either Train 3 or 4 provides safety chilled water cooling for both Safeguard Divisions 3 and 4 and the associated FBVS load. During normal operation, the cross-tie isolation valves (supply and return for both divisions) are normally open. The non-operating chiller and pump(s) are maintained in standby. This configuration also allows for maintenance on the non-operating chiller and pump(s). If the normal operating train pump or chiller fails, a switchover sequence to the standby train is automatically initiated. A planned switchover of the operating train is manually initiated from the MCR.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.9.~~2~~3

This SR verifies proper automatic operation of the SCW train on an actual or simulated actuation signal. The SCW System is a normally operating system that cannot be fully actuated as part of routine testing during normal operation. The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage. Operating experience has shown that these components usually pass the Surveillance when performed at the 24 month Frequency. Therefore, the Frequency is acceptable from a reliability standpoint.

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SR 3.7.9.4

Verifying SCW train leakage is within limits assures an adequate volume of water is maintained for each SCW train for 7 days in post-seismic operation with no make water source available. The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage. Operating experience has shown that these components usually pass the Surveillance when performed at the 24 month Frequency. Therefore, the Frequency is acceptable from a reliability standpoint.

The leakage value of 0.5 gallons per hour considers the worst case pressure difference between one operating SCW train with the SCW Cross-tie Supply and Return valves closed and the opposite SCW train shutdown. The leak test differential pressure across the closed cross-tie valves will be established between a normal operating train with pumps in operation and a shutdown train with pumps secured. This alignment would result in the greatest potential seat leakage across the isolated valves. If the train leakage surveillance is not within allowable limits for a SCW train, that train and the opposite train will be declared inoperable. The duration of SR 3.7.9.4 test should be long enough for the installed instrumentation to accurately measure the system losses with considerations to environmental changes in temperatures effecting the thermal contraction and expansion of water in the SCWS.

06.04-7

REFERENCES

1. FSAR Section 9.2.8.

B 3.7 PLANT SYSTEMS

B 3.7.10 Control Room Emergency Filtration (CREF)

BASES

BACKGROUND

The control room ventilation system consist of the Control Room Emergency Filtration (CREF) units and the Control Room Air Conditioning System (CRACS) air handling units.

The CREF provides a protected environment from which occupants can control the unit following an uncontrolled release of radioactivity, hazardous chemicalstoxic gases, or smoke.

The CREF consists of two independent, redundant trains that recirculate and filter air in the control room envelope (CRE) and a CRE boundary that limits the in-leakage of unfiltered air. Each CREF train consists of a moisture separatorprefilter, electric heating coil, prefilter a high efficiency particulate air (HEPA) filter, an activated charcoal carbon adsorber section for removal of gaseous activity (principally iodines), a post-filter, and a fan. Ductwork, dampers, doors, barriers, and instrumentation also form part of the system. A second bank of HEPA filters follows the adsorber section to collect carbon fines and provides backup in case of failure of the main HEPA filter bank.

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The CRE is the area within the confines of the CRE Boundary boundary that contains the spaces that control room occupants inhabit to control the unit for normal and accident conditions. This area encompasses the control room, and may encompass other non-critical areas to which frequent personnel access or continuous occupancy is not necessary in the event of an accident. The CRE is protected during normal operation, natural events and accident conditions. The CRE boundary is the combination of walls, floor, roof, ducting, doors, penetrations and equipment that physically form the CRE. The OPERABILITY of the CRE boundary must be maintained to ensure that the in-leakage of unfiltered air into the CRE will not exceed the in-leakage assumed in the licensing basis analysis of design basis accident (DBA) consequences to CRE occupants. The CRE and its boundary are defined in the Control Room Envelope Habitability Program.

BASES

BACKGROUND (continued)

06.04-7

The CREF is an emergency system, parts of which may also operate during normal unit operations in the standby mode of operation. Upon receipt of the actuating signal(s), normal air supply to the CRE is isolated, and the stream of ventilation air is recirculated through the system filter trains. The prefilters remove large particles in the air to prevent excessive loading of the HEPA filters and ~~charcoal~~ carbon adsorbers. ~~Continuous operation of each train for at least 10 hours per month, with the heaters on, reduces moisture buildup on the HEPA filters and the charcoal adsorbers.~~

-----------------------------------REVIEWER'S NOTE-----------------------------------
The need for toxic gas isolation state will be determined by the COL applicant.

Actuation of the CREF places the system in [either of two separate states (emergency radiation state or toxic gas isolation state) of] the emergency mode of operation[, depending on the initiation signal]. Actuation of [the system to the emergency radiation state of] the emergency mode of operation closes the unfiltered outside air intake and unfiltered exhaust dampers, and aligns the system for recirculation of the air within the CRE through the redundant trains of HEPA and ~~charcoal~~ carbon filters, ~~.~~ and ~~The emergency radiation state also~~ initiates control room pressurization and filtered ventilation of the air supply to the CRE.

Outside air is mixed with recirculated air from the CRE. This air flows through the CREF ~~filtration~~ unit into a common recirculation plenum where it mixes with air pulled from the CRE rooms. Pressurization of the CRE minimizes infiltration of unfiltered air through the CRE boundary from all the surrounding areas adjacent to the CRE boundary. [The actions taken in the toxic gas isolation state are the same, except that the ~~signal~~ control room operator switches the CREF to a filtration ~~isolation~~ alignment to minimize any outside air from entering the CRE through the CRE boundary.]

The outside air entering the CRE is continuously monitored by radiation [and toxic gas] detectors. One detector output above the setpoint will cause actuation of the emergency mode [, either the emergency radiation state or toxic gas isolation state, as required]. [The actions of the toxic gas isolation state are more restrictive, and will override the actions of the emergency radiation state.]

BASES

BACKGROUND (continued)

06.04-7

One CREF ~~filtration~~ train operating in a filtered alignment at a flow rate of ≤ 4000 cfm (≤ 1000 cfm outside air and 3000 cfm of CRE recirculation air), will pressurize the CRE to ≥ 0.125 inches water gauge relative to all external areas adjacent to the CRE boundary. The CREF operation in maintaining the CRE habitability is discussed in FSAR Section 9.4.1 (Ref. 1).

Redundant supply and recirculation trains provide the required filtration should an excessive pressure drop develop across the other filter train. Isolation dampers are arranged in series so the failure of one damper to shut will not result in a breach of isolation. The CREF is designed in accordance with Seismic Category I requirements.

The CREF is designed to maintain a habitable environment in the CRE for 30 days of continuous occupancy after a design basis accident (DBA) without exceeding a 5 rem whole body dose or its equivalent to any part of the body (5 rem total effective dose equivalent (TEDE)).

APPLICABLE SAFETY ANALYSES

The CREF components are arranged in redundant, safety-~~-~~related ventilation trains. The location of components and ducting within the CRE ensures an adequate supply of filtered air to all areas requiring access. The CREF provides airborne radiological protection for the CRE occupants, as demonstrated by the CRE occupant dose analyses for the most limiting design basis loss of coolant accident, fission product release presented in FSAR Chapter 15 (Ref. 2).

The CREF consists of two 100% capacity ~~iodine filtration~~ trains. Each ~~iodine filtration~~CREF train can be aligned with one of the ~~two~~ four ~~75% capacity~~ air conditioning and recirculation trains. There are only two ~~iodine filtration~~ CREF trains since only slow failure modes are assumed and filtration efficiency is checked periodically. Both CREF trains with two of the four of the associated air conditioning trains are required to be OPERABLE. One CREF train is assumed to be lost to a single failure. The other train provides 100% of the ventilation to the CRE boundary.

-----------------------------------REVIEWER'S NOTE-----------------------------------
The need for toxic gas isolation state will be determined by the COL applicant.

BASES

APPLICABLE SAFETY ANALYSES (continued)

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The CREF provides protection from radiological hazards [, smoke and hazardous chemicalstoxic gases,] and smoke -to the CRE occupants. Reference 3 discusses protection of CRE occupants following a hazardous chemical release. Reference 4 discusses protection of the CRE occupants and their ability to control the reactor from the control room or from the remote shutdown panels in the event of a smoke challenge.

The worst case single active failure of a component of the CREF, assuming a loss of offsite power, does not impair the ability of the system to perform its design function.

The CREF satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

BASES

LCO

In the event of a postulated accident, one iodine filtrationCREF train is required to provide an adequate supply of filtered air to the CRE. To ensure that this requirement is met, both CREF trains must be OPERABLE. The basis for this approach is that two trains are required to satisfy all design requirements (i.e., one train is needed to mitigate the event and other train is assumed to have a single active failure). The failure of both iodine filtrationCREF trains could result in exceeding a dose of 5 rem whole body or its equivalent to any part of the body 5 rem TEDE in the event of a large radioactive release.

Each CREF train is considered OPERABLE when the individual components necessary to limit CRE occupant exposure are OPERABLE. A CREF train is OPERABLE when the associated:

a. Fan is OPERABLE;

b. Prefilters, HEPA filters, and carbon adsorbers, and post-filters are not excessively restricting flow, and are capable of performing their filtration functions; and

c. Heater, ductwork, and dampers are OPERABLE, and air circulation can be maintained.

In order for the CREF trains to be considered OPERABLE, the CRE boundary must be maintained such that the CRE occupant dose from a large radioactive release does not exceed the calculated dose in the licensing basis consequence analyses for postulated accidents, and that CRE occupants are protected from hazardous chemicals[toxic gases and and] smoke.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The LCO is modified by a Note allowing the CRE boundary to be opened intermittently under administrative controls. This Note only applies to openings in the CRE boundary that can be rapidly restored to the design conditions, such as doors, hatches, floor plugs, and access panels. For entry and exit through doors, the administrative control of the opening is performed by the person(s) entering or exiting the area. For other openings, these controls should be procedurelized, and consist of stationing a dedicated individual at the opening who is in continuous communication with the operators in the CRE. This individual will have a method to rapidly close the opening and to restore the CRE boundary to a condition equivalent to the design condition when a need for CRE isolation is indicated.

BASES

APPLICABILITY

In MODES 1, 2, 3, and 4, and during movement of irradiated fuel assemblies, the CREF trains must be OPERABLE to ensure that the CRE will remain habitable during and following a postulated accident (i.e., LOCA, main steam line break, rod ejection, and fuel handling accident).

In MODE 5 or 6, the CREF is also required to cope with a failure of the Gaseous Waste Processing System.

During movement of irradiated fuel assemblies, the CREF trains must be OPERABLE to cope with the release from a fuel handling accident.

ACTIONS

A.1

06.04-7

With one CREF train inoperable, ~~for reasons other than an inoperable CRE boundary,~~ action must be taken to restore OPERABLE status within 7 days. In this Condition, the OPERABLE CREF train is adequate to perform the CRE occupant protection function. However, the overall system reliability is reduced. The 7 day Completion Time is based on the low probability of a postulated accident occurring during this time period, and ability of the remaining train~~s~~ to provide the required capability.

B.1, B.2, and B.3

-----------------------------------REVIEWER'S NOTE-----------------------------------
The need for toxic gas isolation state will be determined by the COL applicant.

BASES

ACTIONS (continued)

If the unfiltered inleakage of potentially contaminated air past the CRE boundary and into the CRE can result in CRE occupant radiological dose greater than the calculated dose of the licensing basis analyses of postulated accident consequences (allowed to be up to 5 rem whole body or its equivalent to any part of the body 5 rem TEDE), or inadequate protection of CRE occupants from ~~hazardous chemicals~~ [toxic gases or] smoke, the CRE boundary is inoperable. Actions must be taken to restore an OPERABLE CRE boundary within 60 days.

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During the period that the CRE boundary is considered inoperable, action must be initiated to implement mitigating actions to lessen the effect on CRE occupants from the potential hazards of a radiological or ~~chemical~~ [toxic gas] event or a challenge from smoke. Actions must be taken within 24 hours to verify that in the event of a postulated accident, the mitigating actions will ensure that CRE occupant radiological exposures will not exceed the calculated dose of the licensing basis analyses of postulated accident consequences, and that CRE occupants are protected from ~~hazardous chemicals~~radiological hazards [, toxic gas] and smoke. These mitigating actions (i.e., actions that are taken to offset the consequences of the inoperable CRE boundary).

BASES

ACTIONS (continued)

should be preplanned for implementation upon entry into the condition, regardless of whether entry is intentional or unintentional. The 24 hour Completion Time is reasonable based on the low probability of a postulated accident occurring during this time period, and the use of mitigating actions. The 60 day Completion Time is reasonable based on the determination that the mitigating actions will ensure protection of CRE occupants within analyzed limits while limiting the probability that CRE occupants will have to implement protective measures that may adversely affect their ability to control the reactor and maintain it in a safe shutdown condition in the event of a postulated accident. In addition, the ~~90~~ 60 day Completion Time is a reasonable time to diagnose, plan and possibly repair, and test most problems with the CRE boundary.

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C.1 and C.2

In MODE 1, 2, 3, or 4, if any Required Action and Completion Time of Condition A or B cannot be met, the unit must be placed in a MODE that minimizes accident risk. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and in MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems.

D.1 and D.2

In MODE 5 or 6, or during movement of irradiated fuel assemblies, if the inoperable CREF train cannot be restored to OPERABLE status within the required Completion Time, action must be taken to immediately place the OPERABLE CREF train in the emergency mode. This action ensures that the other train is OPERABLE, that no failures preventing automatic actuation will occur, and that any active failure would be readily detected.

An alternative to Required Action D.1 is to immediately suspend activities that could result in a release of radioactivity that might require isolation of the CRE. This places the unit in a condition that minimizes risk. This does not preclude the movement of fuel to a safe position.

----------------------------------REVIEWER'S NOTE----------------------------------
The need for toxic gas isolation state will be determined by the COL applicant.

[Required Action D.1 is modified by a Note indicating to place the system in the toxic gas isolation state ~~with outside air isolated~~.]

BASES

ACTIONS (continued)

E.1

06.04-7

In MODE 5 or 6, or during movement of irradiated fuel assemblies, with two CREF trains inoperable, or with ~~one or more CREF trains~~the CRE boundary inoperable ~~due to an inoperable CRE boundary~~, action must be taken immediately to suspend activities that could result in a release of radioactivity that might enter the CRE. This places the unit in a condition that minimizes accident risk. This does not preclude the movement of fuel to a safe position.

F.1

With both ~~Iodine Filtration~~CREF trains ~~and associated Air Conditioning trains~~ inoperable in MODE 1, 2, 3, or 4 ~~for reasons other than an inoperable CRE boundary (i.e., Condition B)~~, the CREF may not be capable of performing the intended function and the unit is in a condition outside the accident analyses. Therefore, LCO 3.0.3 must be entered immediately.

SURVEILLANCE REQUIREMENTS

SR 3.7.10.1

Standby systems should be checked periodically to ensure that they function properly. As the environment and normal operating conditions on this system are not too severe, testing each train once every month provides an adequate check of this system. Monthly heater operations which dry out any moisture accumulated in the carbon adsorber beds from humidity in the ambient air should be performed. Each ~~Iodine filtration~~CREF train must be operated for ≥ 15 minutes with the heaters energized. The 31 day Frequency is based on the reliability of the equipment and the two train redundancy. The heater energization time and 31 day Frequency are consistent with Reference 8.

SR 3.7.10.2

This SR verifies that the required CREF ~~train~~ filter testing is performed in accordance with the Ventilation Filter Testing Program (VFTP). The VFTP includes testing the performance of the HEPA filter, carbon adsorber efficiency, minimum flow rate, and the physical properties of the activated carbon. Specific test Frequencies and additional information are discussed in detail in the VFTP.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.10.3

This SR verifies that each CREF train starts and operates on an actual or simulated actuation signal. The Frequency of 24 months is based on industry operating experience and is consistent with the typical refueling cycle.

SR 3.7.10.4

This SR verifies the OPERABILITY of the CRE boundary by testing for unfiltered air inleakage past the CRE boundary and into the CRE. The details of the testing are specified in the Control Room Envelope Habitability Program.

The CRE is considered habitable when the radiological dose to CRE occupants calculated in the licensing basis analyses of postulated accident consequences is no more than 5 rem whole body or its equivalent to any part of the body 5 rem TEDE and the CRE occupants

06.04-7 are protected from ~~hazardous chemicals~~[toxic gases] and smoke. This SR verifies that the unfiltered air inleakage into the CRE is no greater than the flow rate assumed in the licensing basis analyses of postulated accident consequences. When unfiltered air inleakage is greater than the assumed flow rate, Condition B must be entered. Required Action B.3 allows time to restore the CRE boundary to OPERABLE status provided mitigating actions can ensure that the CRE remains within the licensing basis habitability limits for the occupants following an accident. Mitigating actions, or compensatory measures, are discussed in Regulatory Guide 1.196, Section 2.7.3, (Ref. 5) which endorses, with exceptions, NEI 99-03, Section 8.4 and Appendix F (Ref. 6). These compensatory measures may also be used as mitigating measures as required by Required Action B.2. Temporary analytical methods may also be used as compensatory measures (Ref. 7). Options for restoring the CRE boundary to OPERABLE status include changing the licensing basis postulated accident consequence analysis, repairing the CRE boundary, or a combination of these actions. Depending upon the nature of the problem and the corrective action, a full scope inleakage test may not be necessary to establish that the CRE boundary has been restored to OPERABLE status.

BASES

REFERENCES

1. FSAR Section 9.4.
2. FSAR Section 15.6.
3. Deleted.~~FSAR Section 6.4.~~ 06.04-7
4. FSAR Section 9.5.
5. Regulatory Guide 1.196, Rev. 1, January 2007.
6. NEI 99-03, "Control Room Habitability Assessment," ~~March 2003~~June 2001.
7. Letter from Eric J. Leeds (NRC) to James W. Davis (NEI) dated January 30, 2005, "NEI Draft White Paper, Use of Generic Letter 91-18 Process and Alternative Source Terms in the Context of Control Room Habitability" (ADAMS Accession No. ML040300694).
8. Regulatory Guide 1.52, Rev. 3, June 2001.

B 3.7 PLANT SYSTEMS

B 3.7.11 Control Room Air Conditioning System (CRACS)

BASES

BACKGROUND

The CRACS provides temperature control for the control room envelope (CRE) following isolation of the control room.

The CRACS operates in the recycling mode with fresh outside air makeup. There are two 100% capacity identical fresh air intake trains. Train 1 is located in Safeguard Building 2 and train 4 is located in Safeguard Building 3. For each intake train, the fresh air is taken from outside environment through a motor-operated inlet isolation damper, and a pressure control damper. If operating in the unfiltered bypass alignment (intake air bypasses the CREFcarbon filtration unit), outside air flows through a prefilter and duct heater. The fresh outside air then goes to the common recirculation plenum and mixes with CRE recycled air. The mixed air is then directed through two of the four air conditioning trains.

During normal and emergency operation each CRACS cooling unit provides 50% of the cooling for the rooms within the CRE. However, eEach CRACS air handling unit is capable of cooling up to 7550% of the normal and emergency cooling load to allow a singletwo CRACS air handling units to cool the CRE rooms during a station blackout (SBO) event. During an SBO event, the single CRACS air handling units will prevent the CRE room temperature from exceeding 10478°F.

Each air conditioning train consists of a HEPA final filter, cooling coil, moisture separator, fan suction and discharge silencers, supply air fan, and backdraft damper. The conditioned air is supplied to the control room envelope (CRE) areas. Electric heaters are installed in the supply air ducts to maintain individual room temperature. The air is pulled from the CRE areas into a common recirculation air plenum and then recycled through the air conditioning units for each train. Upon receipt of a high radiation alarm or upon receipt of a containment isolation alarm, the CREF unit operates in the filtered alignment. Operation of either CREF unit or closure of either outside inlet air isolation damper will shut down the normal kitchen or restroom exhaust fan and close isolation dampers in ducting routed to the safeguard building ventilation system (SBVS) where it is exhausted to the outside environment.

During normal operation, the CREF units operate in the bypass alignment (air bypasses the iodine filtration unit). CRE room exhaust from clean areas continues to recycle back to the recirculation plenum and CRACS air conditioning units.The exhaust air from the control room envelope (CRE) areas is directed through the recirculation air plenum and then recycled through the air conditioning trains upstream of the cooling coils

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~~for each train. During emergency operation or if contamination, toxic gas or smoke is detected in either of the two outside air inlets, the CREF filtration unit operates in the filtered alignment. Exhaust air from the CRE (includes exhaust air from the kitchen and restrooms) is also recycled through the CREF iodine filtration trains. During normal operation, the CREF filtration units operate in the bypass alignment (air bypasses the iodine filtration unit). CRE room exhaust from clean areas continues to recycle back to the recirculation plenum and CRACS air conditioning units. Exhaust air from kitchen and restrooms is pulled out of these areas by an exhaust fan and exhausted to the Safeguard Building Ventilation System (SBVS) where it is exhausted to the outside environment.~~

BASES

APPLICABILITY

In MODES 1, 2, 3, 4, 5, and 6, and during movement of irradiated fuel assemblies, the CRACS must be OPERABLE to ensure that the control room temperature will not exceed equipment operational requirements following isolation of the control room.

ACTIONS

A.1

With one CRACS train inoperable, the inoperable train must be returned to OPERABLE status within 120 days. The 120 day Completion Time is based on the assumption that the one CRACS train is out of service for maintenance and is consistent with the dose analysis assumptions in FSAR Chapter 15.

B.1

06.04-7

With two CRACS trains inoperable, action must be taken to restore one CRACS train to OPERABLE status within 30 days. In this Condition, the remaining OPERABLE CRACS trains are adequate to maintain the control room temperature within limits. However, the overall reliability is reduced because a single failure in one of the OPERABLE CRACS trains could result in loss of CRACS function. The 30 day Completion Time is based on the low probability of an event requiring control room isolation, the consideration that the remaining train can provide the required protection, and that alternate safety or non-safety related cooling means are available.

C.1 and C.2

If any Required Action and Associated Completion Time of Condition A or B is not met in MODE 1, 2, 3, or 4, the unit must be placed in a MODE that minimizes the risk. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours and in MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems.

BASES

ACTIONS (continued)

D.1 and D.2

In MODE 5 or 6, or during movement of irradiated fuel, if the inoperable CRACS train(s) cannot be restored to OPERABLE status within the required Completion Time, ~~the~~ an OPERABLE CRACS train must be placed in operation immediately. This action ensures that the remaining train is OPERABLE, that no failures preventing automatic actuation will occur, and that active failures will be readily detected.

06.04-7

An alternative to Required Action D.1 is to immediately suspend activities that present a potential for releasing radioactivity that might require isolation of the control room. This places the unit in a condition that minimizes accident risk. This does not preclude the movement of fuel to a safe position.

E.1

In MODE 5 or 6, or during movement of irradiated fuel assemblies, with three or more CRACS trains inoperable, action must be taken immediately to suspend activities that could result in a release of radioactivity that might require isolation of the control room. This places the unit in a condition that minimizes risk. This does not preclude the movement of fuel to a safe position.

F.1

If three or more CRACS trains are inoperable in MODE 1, 2, 3, or 4, the CRACS may not be capable of performing its intended function. Therefore, LCO 3.0.3 must be entered immediately.

BASES

ACTIONS

A.1

With one SBVS Accident Exhaust Filtration train inoperable, action must be taken to restore OPERABLE status within 7 days. During this period, the remaining OPERABLE train is adequate to perform the SBVS function. The 7 day Completion Time is based on the risk from an event occurring requiring the inoperable SBVS train, and the remaining SBVS train providing the required protection.

B.1

----------------------------------REVIEWER'S NOTE----------------------------------
Adoption of Condition B is dependent on a commitment from the licensee to have guidance available describing compensatory measures to be taken in the event of an intentional and unintentional entry into Condition B.

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----------------------------------REVIEWER'S NOTE----------------------------------
The need for toxic gas isolation state will be determined by the COL applicant.

If the safeguard building controlled areas or fuel building boundary is inoperable in MODE 1, 2, 3, or 4, the SBVS trains may not be able to perform their intended functions. Actions must be taken to restore an OPERABLE safeguard building controlled areas and fuel building boundaries within 24 hours. During the period that the safeguard building controlled areas or fuel building boundary is inoperable, appropriate compensatory measures consistent with the intent, as applicable, of GDC 19 and 10 CFR Part 100 should be utilized to protect plant personnel from potential hazards such as radioactive contamination, [toxic ~~chemicals~~gases,] smoke, temperature and relative humidity, and physical security. Preplanned measures should be available to address these concerns for intentional and unintentional entry into the condition. The 24 hour Completion Time is reasonable based on the low probability of a postulated accident occurring during this time period, and the use of compensatory measures. The 24 hour Completion Time is a typically reasonable time to diagnose, plan and possibly repair, and test most problems with the safeguard building controlled areas or fuel building boundary.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.12.6 and 3.7.12.7

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The SBVS exhausts the safeguard building controlled areas and fuel building atmosphere to the environment through appropriate treatment equipment. Each safety SBVS train is designed to draw down the safeguard building controlled areas and fuel building to a negative pressure of ≤≥ -0.25 inches of water gauge (wg) in ≤ 305 seconds and maintain the safeguard building controlled areas and fuel building at a negative pressure of ≤≥ -0.25 inches wg at a flow rate ≤ 2,640 cfm from the safeguard building controlled areas and fuel building. To ensure that all fission products released to the safeguard building controlled areas and fuel building are treated, SR 3.7.12.6 and SR 3.7.12.7 verify that a pressure in the safeguard building controlled areas and fuel building that is less than the lowest postulated pressure external to the safeguard building controlled areas and fuel building boundaries can be established and maintained. When the SBVS is operating as designed, the establishment and maintenance of safeguard building controlled areas and fuel building pressure cannot be accomplished if the safeguard building controlled areas or fuel building boundaries is not intact. Establishment of this pressure is confirmed by SR 3.7.12.6. SR 3.7.12.7 demonstrates that the safeguard building controlled areas and fuel building can be maintained at a negative pressure of ≤≥ -0.25 inches wg. The primary purpose of these SRs is to ensure safeguard building controlled areas and fuel building boundary integrity. The secondary purpose of these SRs is to ensure that the SBVS train being tested functions as designed. These SRs need not be performed with each safety SBVS train. The SBVS train used for these Surveillances is staggered to ensure that in addition to the requirements of LCO 3.7.12, either safety SBVS train will perform this test. The inoperability of the SBVS does not necessarily constitute a failure of these Surveillances relative to the safeguard building controlled areas and fuel building OPERABILITY. Operating experience has shown the safeguard building controlled areas and fuel building boundaries usually pass these Surveillances when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.