ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Friday, November 18, 2011 2:24 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (AREVA); DELANO Karen (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); KOWALSKI David (AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No. 461, FSAR Ch. 9, Supplement 7
Attachments: RAI 461 Supplement 7 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the eight questions in RAI No. 461 on March 2, 2011. Supplement 1, Supplement 2, Supplement 3, Supplement 4, Supplement 5 and Supplement 6 responses to RAI No. 461 were sent on April 29, 2011, June 8, 2011, July 7, 2011, August 12, 2011, September 13, 2011 and October 13, 2011, respectively, to provide a revised schedule.

The attached file, "RAI 461 Supplement 7 Response US EPR DC.pdf" provides technically correct and complete final responses to five questions (Questions 09.04.01-4, 09.04.01-5, 09.04.03-5, 09.04.05-3 and 09.04.05-4).

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 461 Questions 09.04.03-5, 09.04.05-3 and 09.04.05-4.

The following table indicates the respective pages in the response document, "RAI 461 Supplement 7 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 461 — 09.04.01-4	2	2
RAI 461 — 09.04.01-5	3	3
RAI 461 — 09.04.03-5	4	5
RAI 461 — 09.04.05-3	6	7
RAI 461 — 09.04.05-4	8	8

The schedule for technically correct and complete responses to the remaining three questions has been changed as provided below:

Question #	Response Date
RAI 461 — 09.04.01-3	**February 15, 2012**
RAI 461 — 09.04.03-4	**February 15, 2012**
RAI 461 — 09.04.03-6	**February 15, 2012**

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: WILLIFORD Dennis (RS/NB)
Sent: Thursday, October 13, 2011 4:17 PM
To: Getachew.Tesfaye@nrc.gov
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. 461, FSAR Ch. 9, Supplement 6

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the eight questions in RAI No. 461 on March 2, 2011. Supplement 1, Supplement 2, Supplement 3, Supplement 4 and Supplement 5 responses to RAI No. 461 were sent on April 29, 2011, June 8, 2011, July 7, 2011, August 12, 2011 and September 13, 2011, respectively, to provide a revised schedule.

The schedule for technically correct and complete responses to the eight questions has been changed as provided below.

Question #	Response Date
RAI 461 — 09.04.01-3	**November 18, 2011**
RAI 461 — 09.04.01-4	**November 18, 2011**
RAI 461 — 09.04.01-5	**November 18, 2011**
RAI 461 — 09.04.03-4	**November 18, 2011**
RAI 461 — 09.04.03-5	**November 18, 2011**
RAI 461 — 09.04.03-6	**November 18, 2011**
RAI 461 — 09.04.05-3	**November 18, 2011**
RAI 461 — 09.04.05-4	**November 18, 2011**

Sincerely,

Dennis Williford, P.E.
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From: WILLIFORD Dennis (RS/NB)
Sent: Tuesday, September 13, 2011 4:41 PM
To: Getachew.Tesfaye@nrc.gov
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. 461, FSAR Ch. 9, Supplement 5

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the eight questions in RAI No. 461 on March 2, 2011. Supplement 1, Supplement 2, Supplement 3 and Supplement 4 responses to RAI No. 461 were sent on April 29, 2011, June 8, 2011, July 7, 2011 and August 12, 2011, respectively, to provide a revised schedule.

The schedule for technically correct and complete final responses to the eight questions has been changed and is provided below.

Question #	Response Date
RAI 461 — 09.04.01-3	**October 13, 2011**
RAI 461 — 09.04.01-4	**October 13, 2011**
RAI 461 — 09.04.01-5	**October 13, 2011**
RAI 461 — 09.04.03-4	**October 13, 2011**
RAI 461 — 09.04.03-5	**October 13, 2011**
RAI 461 — 09.04.03-6	**October 13, 2011**
RAI 461 — 09.04.05-3	**October 13, 2011**
RAI 461 — 09.04.05-4	**October 13, 2011**

Sincerely,

Dennis Williford, P.E.
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From: WILLIFORD Dennis (RS/NB)
Sent: Friday, August 12, 2011 3:21 PM
To: Getachew.Tesfaye@nrc.gov
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. 461, FSAR Ch. 9, Supplement 4

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the eight questions in RAI No. 461 on March 2, 2011. Supplement 1, Supplement 2 and Supplement 3 responses to RAI No. 461 were sent on April 29, 2011, June 8, 2011 and July 7, 2011, respectively, to provide a revised schedule.

The schedule for technically correct and complete responses to the eight questions has been changed and is provided below.

Question #	Response Date

RAI 461 — 09.04.01-3	**September 13, 2011**
RAI 461 — 09.04.01-4	**September 13, 2011**
RAI 461 — 09.04.01-5	**September 13, 2011**
RAI 461 — 09.04.03-4	**September 13, 2011**
RAI 461 — 09.04.03-5	**September 13, 2011**
RAI 461 — 09.04.03-6	**September 13, 2011**
RAI 461 — 09.04.05-3	**September 13, 2011**
RAI 461 — 09.04.05-4	**September 13, 2011**

Sincerely,

Dennis Williford, P.E.
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From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, July 07, 2011 4:39 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. 461, FSAR Ch. 9, Supplement 3

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the eight questions in RAI No. 461 on March 2, 2011. Supplement 1 and Supplement 2 responses to RAI No. 461 were sent on April 29, 2011 and June 8, 2011, respectively, to provide a revised schedule.

The schedule for technically correct and complete responses to the eight questions has been changed as provided below.

Question #	**Response Date**
RAI 461 — 09.04.01-3	**August 12, 2011**
RAI 461 — 09.04.01-4	**August 12, 2011**
RAI 461 — 09.04.01-5	**August 12, 2011**
RAI 461 — 09.04.03-4	**August 12, 2011**
RAI 461 — 09.04.03-5	**August 12, 2011**
RAI 461 — 09.04.03-6	**August 12, 2011**
RAI 461 — 09.04.05-3	**August 12, 2011**
RAI 461 — 09.04.05-4	**August 12, 2011**

Sincerely,

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Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, June 08, 2011 8:00 AM
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. 461, FSAR Ch. 9, Supplement 2

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the eight questions in RAI No. 461 on March 2, 2011. Supplement 1 response to RAI No. 461 was sent on April 29, 2011 to provide a revised schedule.

The schedule for technically correct and complete responses to the eight questions has been changed and is provided below.

Question #	Response Date
RAI 461 — 09.04.01-3	July 8, 2011
RAI 461 — 09.04.01-4	July 8, 2011
RAI 461 — 09.04.01-5	July 8, 2011
RAI 461 — 09.04.03-4	July 8, 2011
RAI 461 — 09.04.03-5	July 8, 2011
RAI 461 — 09.04.03-6	July 8, 2011
RAI 461 — 09.04.05-3	July 8, 2011
RAI 461 — 09.04.05-4	July 8, 2011

Sincerely,

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7207 IBM Drive, Mail Code CLT 2B
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Email: Dennis.Williford@areva.com

From: WELLS Russell (RS/NB)
Sent: Friday, April 29, 2011 8:11 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. 461, FSAR Ch. 9, Supplement 1

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the eight questions in RAI No. 461 on March 2, 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 questions is provided below.

Question #	Response Date
RAI 461 — 09.04.01-3	June 8, 2011
RAI 461 — 09.04.01-4	June 8, 2011
RAI 461 — 09.04.01-5	June 8, 2011
RAI 461 — 09.04.03-4	June 8, 2011
RAI 461 — 09.04.03-5	June 8, 2011
RAI 461 — 09.04.03-6	June 8, 2011
RAI 461 — 09.04.05-3	June 8, 2011
RAI 461 — 09.04.05-4	June 8, 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: Wednesday, March 02, 2011 2:14 PM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); KOWALSKI David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 461, FSAR Ch. 9

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 461 Response US EPR DC," provides a schedule since technically correct and complete responses to the eight questions are not provided.

The following table indicates the respective pages in the response document, “RAI 461 Response US EPR DC.pdf,” that contain AREVA NP’s response to the subject questions.

Question #	Start Page	End Page
RAI 461 — 09.04.01-3	2	2
RAI 461 — 09.04.01-4	3	3
RAI 461 — 09.04.01-5	4	4
RAI 461 — 09.04.03-4	5	5
RAI 461 — 09.04.03-5	6	6
RAI 461 — 09.04.03-6	7	7
RAI 461 — 09.04.05-3	8	8
RAI 461 — 09.04.05-4	9	9

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

Question #	Response Date
RAI 461 — 09.04.01-3	April 29, 2011
RAI 461 — 09.04.01-4	April 29, 2011
RAI 461 — 09.04.01-5	April 29, 2011
RAI 461 — 09.04.03-4	April 29, 2011
RAI 461 — 09.04.03-5	April 29, 2011
RAI 461 — 09.04.03-6	April 29, 2011
RAI 461 — 09.04.05-3	April 29, 2011
RAI 461 — 09.04.05-4	April 29, 2011

Sincerely,

Russ Wells
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AREVA NP, Inc.
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434-942-6375 (cell)
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Russell.Wells@Areva.com

From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Thursday, February 03, 2011 10:29 AM
To: ZZ-DL-A-USEPR-DL
Cc: ODriscoll, James; Jackson, Christopher; McKirgan, John; Hearn, Peter; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 461(5223, 5292, 5293), FSAR Ch. 9

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 February 3, 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: 3575

Mail Envelope Properties (2FBE1051AEB2E748A0F98DF9EEE5A5D49B58FB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 461, FSAR Ch. 9, Supplement 7
Sent Date: 11/18/2011 2:24:04 PM
Received Date: 11/18/2011 2:24:10 PM
From: WILLIFORD Dennis (AREVA)

Created By: Dennis.Williford@areva.com

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"RYAN Tom (AREVA)" <Tom.Ryan@areva.com>
Tracking Status: None
"KOWALSKI David (AREVA)" <David.Kowalski@areva.com>
Tracking Status: None
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Tracking Status: None

Post Office: auscharmx02.adom.ad.corp

Files	**Size**	**Date & Time**
MESSAGE	13750	11/18/2011 2:24:10 PM
RAI 461 Supplement 7 Response US EPR DC.pdf		301756

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

Response to

Request for Additional Information No. 461 (5223, 5292, 5293), Supplement 7

2/3/2011

U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.04.01 - Control Room Area Ventilation System
SRP Section: 09.04.03 - Auxiliary and Radwaste Area Ventilation System
SRP Section: 09.04.05 - Engineered Safety Feature Ventilation System

Application Section: 9.4.

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

Question 09.04.01-4:

During review of FSAR Tier 2 revision 2, the staff noted that FSAR Tier 2 Paragraph 9.4.13.2.1 refers to FSAR drawings that have been deleted. The paragraph discusses the SCS Supply and Exhaust Air Subsystem for the Interconnecting Passageway between Safeguards Building Division 2 and Division 3. Therefore:

a. Clarify the paragraph to delete references to deleted drawings.

b. Provide drawings or further illustration that clarifies the arrangement that you describe.

Response to Question 09.04.01-4:

a. U.S. EPR FSAR Tier 2, Section 9.4.13, currently refers to one figure, Figure 9.4.13-1, “Typical Configuration of Smoke Confinement System”. This figure was revised in U.S. EPR FSAR, Revision 3, to remove an incorrect title.

   U.S. EPR FSAR Tier 2, Figure 9.4.13-2, “Smoke Confinement System Interconnecting Passageway” was deleted in U.S. EPR FSAR, Revision 2.

b. See the Response to Question 09.04.01-4, Part (a).

FSAR Impact:

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

Question 09.04.01-5:

During review of FSAR Tier 2 revision 2, the staff noted that the third paragraph in FSAR Tier 2 9.4.1.2.3, “Abnormal operating conditions” section has been changed. The described response of the CRACS to a toxic gas event is different from that described in the previous revision of the FSAR and your previous response to RAI No. 135 Question 09.04.05-1 part 3b.

Notwithstanding COL Item 6.4-1, which requires a COL applicant that references the U.S. EPR design certification to identify any Seismic Category I Class IE toxic gas sensors necessary for control room operator protection and COL Item 6.4-3, to evaluate the results of a site specific toxic gas analysis and the impact on the control room habitability in accordance with RG 1.78, the FSAR describes the response of the CRACS design to a toxic gas event. This description includes details of toxic gas monitoring equipment, and visual audible MCR alarms. Similarly FSAR Section 6.4 describes control room habitability systems that detect toxic gases, specifically carbon monoxide and carbon dioxide. Tier 2 Section 6.4.6, Instrumentation Requirements, refers to Section 9.4.1 for details on these instruments. Tier 2 Section 9.4.1.5, Instrumentation Requirements only discusses CREF instrumentation. This list does not include any instrumentation, alarms displays and controls used to detect and respond to a toxic gas event, yet FSAR section 9.4.1.2.3 describes automatic actuation of CRACS components by such instruments. In FSAR section 9.4.1, Table 9.4.1-1 includes a list of minimum instrumentation, indication and alarm features for that portion of the CRACS that functions to respond to a toxic gas event. Alternatively, include a new COL Item for section 9.4 to ensure that a COL applicant that references the EPR standard design provides details of the toxic gas instrumentation in the COL FSAR, to include not only the types of toxic gas sensors, but also the details of automatic actuation of CRACS SSCs, the minimum inventory of required MCR alarms displays and controls for such instrumentation.

Response to Question 09.04.01-5:

The response to this question is addressed in the Response to RAI 462, Question 06.04-7.

FSAR Impact:

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

Question 09.04.03-5:

Follow-up to RAI 135, Question 09.04.05-1

In RAI 135, Question 09.04.05-1, item #7, the staff requested you to clarify the testing requirements for the NABVS and the RWBVS as they relate to guidance contained in RG 1.140 regulatory position C3.6, which states:

“Normal atmosphere cleanup system housings and ductwork should be designed to exhibit, on test, a maximum total leakage rate as defined in Article SA-4500 of ASME AG-1-1997 (Ref. 3). Duct and housing leak tests should be performed in accordance with Section TA of ASME AG-1-1997”

In a response supplement #1 to RAI 135, dated February 27, 2009, you provided a response to question number 09.04.05-1, item #7 that included FSAR Tier 1 and Tier 2 mark ups. The staff has reviewed the response and FSAR revision 2 and the following information is required:

1. The FSAR is still unclear as to timing and method of the performance of the duct and housing leak tests on the NABVS and RWBVS. The applicable criteria, of AG-1 as written only applies to the components listed in section 9.4.3.2.2 for the NABVS and section 9.4.8.2.2 for the RWBVS of the FSAR. The system startup tests in chapter 14 of the FSAR do not list acceptance criteria for system leakage; therefore,
    a. Revise the FSAR to add a “Ductwork and accessories section for the RWBVS” to Tier 2 section 9.4.8.2.2, in order to clarify that the testing requirements are also applicable to RWBVS ductwork.
    b. Add total system leakage acceptance criterion to the respective startup test acceptance criteria section.
2. Item 1.b also applies to all ventilation system startup tests for those systems that are subject to either RG 1.52 or RG 1.140. These systems include the FBVS, CBVS, CRACS, SBVS, SBVSE, and the ABVS. Clarify the FSAR for these systems as it applies to item 1.b.

Response to Question 09.04.03-5:

1. Refer to the Response to RAI 462, Question 06.05-01-5, for clarification of testing requirements of the Nuclear Auxiliary Building Ventilation System (NABVS) and Radioactive Waste Building Ventilation System (RWBVS) and the use of ASME AG-1-2003 and ASME AG-1-1997.
    a. U.S. EPR FSAR Tier 2, Section 9.4.8.2.2, was revised in Revision 3 to clarify that the testing requirements are also applicable to the RWBVS ductwork.
    b. A statement was added to the testing method and acceptance criteria section of the NABVS, RWBVS and Access Building Ventilation System (ABVS) to verify that the total system leakage acceptance criterion is satisfied per the guidelines of RG 1.140.

       U.S. EPR FSAR Tier 2, Sections 9.4.3.4, 9.4.8.4, 9.4.14.5 and 9.4.14.7 were revised in Revision 3 to reflect updated testing requirements information.

2. A statement was added to the testing method and acceptance criteria section of the Annulus Ventilation System (AVS), Fuel Building Ventilation System (FBVS), Containment Building Ventilation System (CBVS), Main Control Room Air Conditioning System (CRACS), and Safeguard Building Controlled-Area Ventilation System (SBVS) to verify that total system leakage acceptance criterion is satisfied per the guidelines of RG 1.52.

   Note that the Electrical Division of Safeguard Building Ventilation System (SBVSE) is a clean air system for the Safeguard Building and is not designed to be an engineered safety feature (ESF) atmosphere cleanup system. ESF atmospheric clean up is completed for the Safeguards Building by the SBVS, which is designed to meet the guidelines of RG 1.52.

   U.S. EPR FSAR Tier 2, Sections 6.2.3.4, 9.4.1.4, 9.4.2.4, 9.4.2.6, 9.4.5.4, 9.4.7.4, and 9.4.7.4.1 were revised in Revision 3 to reflect updated testing requirements information.

   The following U.S. EPR preoperational test procedures will also be revised in the U.S. EPR FSAR, to reflect updated testing requirements information:

   – U.S. EPR FSAR Tier 2, Section 14.2.12.8.1, Containment Building Cooling (Test #073).
   – U.S. EPR FSAR Tier 2, Section 14.2.12.8.6, Electrical Division of Safeguard Building Ventilation System (Test #078).
   – U.S. EPR FSAR Tier 2, Section 14.2.12.8.7, Nuclear Auxiliary Building Ventilation System (Test #079).
   – U.S. EPR FSAR Tier 2, Section 14.2.12.8.8, Radioactive Waste Building Ventilation System (Test #080).
   – U.S. EPR FSAR Tier 2, Section 14.2.12.8.9, Fuel Building Ventilation System (Test #081).
   – U.S. EPR FSAR Tier 2, Section 14.2.12.8.10, Main Control Room Air Conditioning System (Test #082).
   – U.S. EPR FSAR Tier 2, Section 14.2.12.8.11, Safeguard Building Controlled Area Ventilation System (Test #083).
   – U.S. EPR FSAR Tier 2, Section 14.2.12.8.19, Access Building Ventilation System (Test #224).

FSAR Impact:

U.S. EPR FSAR Tier 2, Sections 6.2.3.4, 9.4.1.4, 9.4.2.4, 9.4.2.6, 9.4.3.4, 9.4.5.4, 9.4.7.4, 9.4.7.4.1, 9.4.8.2.2, 9.4.8.4, 9.4.14.5, and 9.4.14.7 were revised in Revision 3, as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR Tier 2, Sections14.2.12.8.1, 14.2.12.8.6, 14.2.12.8.7, 14.2.12.8.8, 14.2.12.8.9, 14.2.12.8.10, 14.2.12.8.11 and 14.2.12.8.19 will be revised as described in the response and indicated on the enclosed markup.

Question 09.04.05-3:

The FSAR describes the Safeguard Buildings as being divided into controlled areas, which are potentially contaminated. These controlled areas are serviced by the SBVS. The balance of the SB is serviced by the SBVSE. The Tier 2 FSAR section 9.4.6.1 does not state that that SBVSE is subject to GDC 60. FSAR section 9.4.6.2.1 states that the SBVSE contains connections providing air to the mechanical controlled areas. FSAR section 3.8.4.1.3 states that the lower levels of the SBs, which contain the mechanical equipment, and the upper levels of the SBs contain electrical equipment. Cable pipe and duct shafts are located within the SBs for routing distribution between the various elevations of the buildings. Based on this review the staff requests the following information:

2. Justify not subjecting the SBVSE to GDC 60. i.e., identify in the FSAR, the controls that separate contaminated areas from clean areas in the safeguards buildings.
    a. The justification should include a general discussion of controls that exist to prevent the migration of contamination from contaminated areas to clean areas of the SB. (Areas serviced by the SBVS to areas serviced by the SBVSE).
    b. The justification should specifically address the function of the SBVSE in the event of a RCP thermal barrier failure, or the escape of contamination contained within the CCW system.
    c. Alternatively, clarify that the SBVSE is subject to GDC 60, and provide appropriate justification.
    d. Alternatively, clarify the utilization of the NABVS or the SBVS or other atmosphere cleanup system with the SBVSE to clean up the SBVSE atmosphere if required.
3. Figure 9.4.6.1, Safeguards Building Electrical Divisions 1 and 4 air intake is missing the supply air fan. Add the symbol to the drawing.

Response to Question 09.04.05-3:

1. The following clarification was made in Revision 3 of the U.S. EPR FSAR to identify the controls that separate contaminated areas from clean areas in the Safeguard Buildings:
    a. U.S. EPR FSAR Tier 2, Section 9.4.5.2.3, was revised in Revision 3 to include a general discussion of the controls that exist to prevent the migration of contamination from contaminated areas to clean areas of the SB.

       The “Normal Plant Operation” section was revised in Revision 3 to state:

       > “A negative pressure is maintained in the SB controlled areas for the iodine risk rooms (safety injection, residual heat removal, and severe accident heat removal systems equipment rooms) relative to the outside environment. The air supplied to the SB controlled areas by the electrical division of the Safeguard Building ventilation system (SBVSE) is automatically adjusted by a damper in the supply air ducting that receives a pressure control signal, which maintains a negative pressure in the SB controlled areas, relative to the outside environment (ambient pressure). The SBVS maintains the SB Electrical Division at ambient pressure. This system design configuration maintains potentially contaminated SB controlled areas at a negative pressure, relative to the clean areas of the SB Electrical Division.”

The “Loss of Coolant Accident” section was revised in Revision 3 to state:

> “In the event of a loss of coolant accident (LOCA), a containment isolation signal initiates isolation of the SB controlled areas from the supply to the SBVSE and the exhaust from the NABVS. Air is supplied from the SB controlled areas and exhausted through the SBVS iodine exhaust filtration trains (located in the FB) and discharged to the plant vent stack. To support the operation of plant equipment, recirculation cooling units maintain rooms in the SB controlled areas at ambient conditions.
>
> In the event of a LOCA, the containment isolation signal initiates isolation of the FB from NABVS supply and exhaust duct to limit leakage into the FB. The SBVS maintains negative pressure in the FB and exhaust air from the FB is directed to the SBVS iodine filtration trains (refer to Section 9.4.2).”

b. U.S. EPR FSAR Tier 2, Section 9.4.6.1, was revised in Revision 3 to include a general discussion addressing the function of the SBVSE in the event of an RCP thermal barrier failure or contamination contained within the CCWS.

The following discussion was added to this section in Revision 3:

> “During normal plant operation, the SBVSE supplies air to the SB controlled areas. The flow of air is automatically adjusted by a damper in the supply air ducting that receives a pressure control signal, which maintains a negative pressure in the SB controlled areas, relative to the outside environment. The SBVS maintains the SB Electrical Division at ambient pressure. With a negative pressure maintained in the SB controlled areas and an ambient pressure maintained in the SB Electrical Division, a clean air environment is sustained within the SB Electrical Division.
>
> Following the receipt of a containment isolation signal, supply air to the SBVSE is automatically closed to maintain isolation between the clean areas of the SB Electrical Division and the potentially contaminated SB controlled areas.
>
> The SB Electrical Division is maintained as a clean air environment. In the event of a RCP thermal barrier failure or if radiation is detected within the component cooling water system (CCWS), the SBVSE can be shut down and isolated from the main control room. The affected areas can then be isolated to prevent the potential release of contaminants.”

c. See the Response to Question 09.04.05-3, Parts 1a and 1b.

d. See the Response to Question 09.04.05-3, Parts 1a and 1b.

2. U.S. EPR FSAR Tier 2, Figure 9.4.6-1, “Safeguard Building Electrical Divisions 1 and 4 Air Intake,” was revised in Revision 3 to reflect the addition of the supply air fan to the air intake.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.4.5.2.3, Section 9.4.6.1 and Figure 9.4.6-1 were revised in Revision 3 as described in the response and indicated on the enclosed markup.

Question 09.04.05-4:

FSAR section 9.4.9.1 “Design Basis” states “The EPGBVS maintains acceptable temperatures and air renewals in each of the four divisions to support operation of the emergency diesel generators (EDG) and electrical control panels”. Based on this statement, the staff considers the EPGBVS an Engineered Safety Feature Ventilation System. NUREG-0800 section 9.4.5 is used by the staff to review such systems. Section II of this SRP “Acceptance Criteria” states that such systems are subject to GDC 17. Part III “Review Procedures states the following:

> “The ESFVS is reviewed to ensure that adequate means is provided in the system design for control of airborne particulate material (dust) accumulation. The system arrangement is reviewed to verify that a minimum of seven meters (20 feet) exists from the bottom of all fresh air intakes to grade elevation, or that electrical cabinets are provided with suitable seals or gaskets”.

There is currently sufficient information in the FSAR for the staff to review this criterion and make a finding with respect to GDC 17, however the design basis section of the EPGBVS description does not declare GDC 17 as a design criterion.

The following clarification is needed in the FSAR:

> In Section 9.4.9.1 of the FSAR, declare that the EPGBVS is subject to GDC 17. Justify that the EPGBVS complies with GDC 17.

Response to Question 09.04.05-4:

U.S. EPR FSAR Tier 2, Section 9.4.9.1, will be revised to state that GDC 17 is a required general design criterion for the emergency power generating building ventilation system (EPGBVS).

The U.S. EPR contains an onsite and offsite electric power system that supports the functioning of structures, systems and components important to safety in the event of postulated accidents and anticipated operational occurrences. The EPGBVS maintains a minimum clearance of 20 feet from the bottom of fresh air intakes to grade elevation, and electrical cabinets are provided with suitable seals or gaskets. These features maintain proper functioning of the essential electric power system by meeting the guidelines of NUREG-CR/0660 (Reference 1), as related to the accumulation of dust and particulate material.

The essential onsite electrical power systems meet the guidance of NUREG-CR/0660 (Subsection A - Item 2 and Subsection C - Item 1) for protection of essential electrical components (such as contactors, relays, circuit breakers) from failure due to the accumulation of dust and particulate materials. This is accomplished by the use of filters and supply air units in the EPGBVS.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.4.9.1 will be revised in Revision 3 as described in the response and indicated on the enclosed markup.

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at the wall penetration between the Fuel Building and Nuclear Auxiliary Building ventilation supply and exhaust shafts to reduce the possibility for fire propagation.

Analyses have demonstrated the ability of the AVS to depressurize and maintain a subatmospheric pressure in the annulus during normal operation and following a design basis LOCA. The LOCA is assumed to occur concurrent with a loss of off-site power, and a loss of one of the accident trains. The total thermal and pressure expansion of the primary containment structure is assumed to occur prior to the start of the remaining accident train, resulting in a starting pressure of 14.712 psia. The drawdown of the annulus is started 60 seconds after the start of the postulated accident. Analytical results indicate that the pressure in the annulus reaches a subatmospheric pressure sufficient for the AVS to perform its safety function with substantial margin. Analytical specifications and results are presented in Table 6.2.3-2.

6.2.3.4 Inspection and Testing Requirements

The AVS major components, such as dampers, motors, fans, filters, heaters, and ducts are located to provide access for initial and periodic testing to verify their integrity.

Initial in-place acceptance testing of the AVS is performed as described in Section 14.2 (test abstracts #077 and #203), Initial Plant Test Program, to verify the system is built in accordance with applicable programs and specifications.

The AVS is designed with adequate instrumentation for differential pressure, temperature, and flow indicating devices to enable testing and verification of equipment function, heat transfer capability and air flow monitoring.

During normal plant operation, periodic testing of AVS is performed to demonstrate system and component operability and integrity.

Isolation dampers are periodically inspected and damper seats replaced as required.

Per IEEE 334 (Reference 17), type tests of continuous duty class 1E motors for AVS are conducted to confirm ESF system operation and availability.

Fans are tested by manufacturer in accordance with Air Movement and Control Association (AMCA) standards (References 18, 19, and 20). Air filters are tested in accordance with the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standards (Reference 21).

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 22), American Society of Mechanical Engineers, ASME N510 (Reference 23), ASME AG-1 (Reference 24), and RG 1.52 (Reference 25).

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During normal operation, equipment rotation is utilized to reduce and equalize wear on redundant equipment during normal operation.

Isolation dampers are periodically inspected and damper seats replaced as required.

Per IEEE 334 (Reference 9), type tests of continuous duty class 1E motors for CREF are conducted to maintain ESF system operation and availability.

Air handling units are tested by manufacturer in accordance with Air Movement and Control Association (AMCA) standards (References 4, 5, and 6). Air filters are tested in accordance with the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standards (Reference 2). Cooling coils are hydrostatically tested in accordance with ASME AG-1 (Reference 1) and their performance is rated in accordance with the Air Conditioning and Refrigeration Institute (ARI) standards (Reference 10).

09.04.03-5

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 11), American Society of Mechanical Engineers, ASME N510 (Reference 3), ASME AG-1 (Reference 1), and RG 1.52 (Reference 12).

Outside air inlet heaters are tested in accordance with ASME AG-1, Section CA (Reference 1).

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 12), ASME N510 (Reference 3) and ASME AG-1 (Reference 1). The charcoal adsorber samples are tested for efficiency in accordance with RG 1.52 (Reference 12) and ASTM D3803 (Reference 13). Air 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.

Recirculation cooling units are tested by manufacturer in accordance with Air Movement and Control Association (AMCA) standards (References 4, 5, and 6). Cooling coils are hydrostatically tested in accordance with ASME AG-1 (Reference 1) and their performance is rated in accordance with the Air Conditioning and Refrigeration Institute (ARI) standards (Reference 7).

09.04.03-5

Ductwork is leak-tested in accordance with the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) technical manual "HVAC Air Duct Leakage Test Manual" (Reference 8), American Society of Mechanical Engineers, ASME N510 (Reference 9), ASME AG-1 (Reference 1), and RG 1.52 (Reference 11).

Fan heaters are tested in accordance with ASME AG-1, Section CA (Reference 1).

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

9.4.2.5 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 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 11.5.3.1.7 and Table 11.5-1, Monitors R-17, R-18, and R-19.

9.4.2.6 References

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

2. UL 555, “Standard for Fire Dampers,” Underwriter’s Laboratories, Sixth Edition, June 1999.

3. “ASHRAE Handbook Fundamentals,” American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc., 2005.

4. ANSI/AMCA-210-1999, "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, December 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, December 1987.

7. ANSI/ ARI Standard 410-2001, "Forced-Circulation Air-Cooling and Air-Heating Coils," Air Conditioning and Refrigeration Institute, 2001.

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

9. ASME N510-1989 (R1996), "Testing of Nuclear Air-Treatment Systems," The American Society of Mechanical Engineers, 1989.

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

09.04.03-5

11. 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.

Next File

9.4.3 Nuclear Auxiliary Building Ventilation System

The nuclear auxiliary building ventilation system (NABVS) provides conditioned air to the Nuclear Auxiliary Building (NAB) to maintain acceptable ambient conditions, to permit personnel access, and to control the concentration of airborne radioactive material during normal operations and anticipated occupational occurrences. The system also provides conditioned air to the Fuel Building (FB), Containment Building, and the annulus area between the Containment Building and the Shield Building.

The exhaust air from the NAB, FB, Safeguard Building (SB), Containment Building, and the annulus is processed through the NABVS filtration trains prior to release to the environment via the vent stack.

9.4.3.1 Design Basis

The NABVS provides a safety-related function to provide isolation between the vent stack and the NABVS exhaust. A safety-related Seismic Category I check damper is located in the NABVS exhaust at the vent stack.

All remaining components of the NABVS are non-safety related and Non-Seismic, as specified in Section 3.2.

- The NABVS meets GDC-2 for all components as it relates to meeting the seismic design criteria based on the guidance of RG 1.29 Position C.2 (GDC-2).
- The NABVS has no shared systems or components with other nuclear power units (GDC-5).
- The NABVS meets GDC-60, as it relates to the ability of the system to limit release of gaseous radioactive effluents to the environment. The NABVS exhaust iodine filtration trains meet the guidance of RG 1.140 Positions C.2 and C.3. RG 1.52 is not applicable because the NABVS is not required to operate during post-accident engineered safety features (ESF) atmospheric cleanup. The air flow rate of a single cleanup filtration unit will not exceed 30,000 cfm.

09.04.03-5

The NABVS performs the following safety-related function:

- A safety-related check damper is located in the NABVS exhaust at the vent stack. This check damper isolates the NABVS as required from the other safety systems exhausting to the vent stack during accident operation.
- The remaining portions of the NABVS perform no safety-related functions and the system is not required to operate during a design basis accident.

The NABVS performs the following important non-safety-related system functions:

- Controls and maintains a negative pressure within the NAB relative to the outside environment.

In case of a DBA, the NABVS is isolated from the HVAC systems of other buildings by isolation dampers.

The NABVS provides adequate capacity and redundant trains to maintain proper temperature levels in the NAB, FB, Containment Building, and annulus.

9.4.3.4 Inspection and Testing Requirements

The NABVS major components, such as dampers, motors, fans, filters, coils, heaters, and ducts are located to provide access for initial and periodic testing to verify their integrity.

Initial in-place acceptance testing of the NABVS is performed as described in Section 14.2 (test abstracts #079 and #203), Initial Plant Test Program, to verify the system is built in accordance with applicable programs and specifications.

The NABVS is designed with adequate instrumentation for differential pressure, temperature, and flow indicating devices to enable testing and verification of equipment function, heat transfer capability and air flow monitoring.

During normal plant operation, periodic testing of NABVS is performed to demonstrate system and component operability and integrity.

During normal operation, equipment rotation is utilized to reduce and equalize wear on redundant equipment during normal operation.

Isolation dampers are periodically inspected and damper seats replaced as required.

Fans and air handling units are tested by manufacturer in accordance with Air Movement and Control Association (AMCA) standards (References 4, 5, and 6). Air filters are tested in accordance with the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standards (Reference 2). Cooling coils are hydrostatically tested and their performance is rated in accordance with the Air Conditioning and Refrigeration Institute (ARI) standards (Reference 8).

09.04.03-5

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 9), American Society of Mechanical Engineers, ASME N510 (Reference 3), ASME AG-1 (Reference 1), and RG 1.140 (Reference 10).

Outside air inlet heaters are tested in accordance with ASME AG-1, Section CA (Reference 1).

Carbon filtration units are tested by manufacturer for housing leakage, filter bypass leakage and airflow performance. Periodically and subsequent to each filter or

- Supply air flow to the rooms where safety injection and residual heat removal system equipment is located in divisions 1 and 4.

- Supply and exhaust air flow to the rooms where severe accident heat removal system components are located in division 4.

- Supply and exhaust air flow to and from the personnel air lock area in division 2.

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A negative pressure is maintained in the SB controlled areas. A negative pressure is also maintained for the iodine risk rooms (safety injection, residual heat removal, and severe accident heat removal systems equipment rooms) relative to the outside environment. The air supplied to the SB controlled areas by the electrical division of the safeguard building ventilation system (SBVSE) is automatically adjusted by a damper in the supply air ducting that receives a pressure control signal, which maintains a negative pressure in the SB controlled areas, relative to the outside environment (ambient pressure). The SBVS maintains the SB Electrical Division at ambient pressure. This system design configuration maintains potentially contaminated SB controlled areas at a negative pressure, relative to the clean areas of the SB Electrical Division.

The electrical air heating convectors are used in the service corridors, interconnecting passageway, and stairways to maintain comfortable temperatures in these areas. The operation of convectors is automatically controlled by the temperature sensors located in these areas.

The recirculation cooling units provide recycled cool air to the rooms where high heat load equipment is located. The operation of recirculation cooling units is automatically controlled by the temperature sensors located in these rooms.

Plant Outage Condition

During the plant outage condition, the system configuration will remain the same as during normal plant operation except the following:

- Air supply and exhaust of the rooms where the safety injection and residual heat removal systems equipment are located in SB divisions 1 and 4 are isolated by closing the associated dampers.

- If the personnel air lock is open, the air supply and exhaust air flow to and from the personnel air lock area is placed in service by manually closing or opening the associated dampers.

- If maintenance is performed on the equipment or systems which pose delayed iodine release hazard, the exhaust air from these areas is diverted to the iodine filtration plenum of the NABVS prior to discharge through the plant stack (refer to Section 9.4.3).

- Recirculation cooling units in the SB divisions one and four, where the EFW valves are located.

Loss of Ultimate Heat Sink

During loss of ultimate heat sink (LUHS), the air flow of the recirculation cooling units is cooled by the chilled water provided by the SCWS. Two water-cooled chillers are located in divisions two and three, and two air-cooled chillers are located in divisions one and four. In case of LUHS, the water-cooled chillers are not available. With the safety chilled water divisions 1/2 and 3/4 interconnect, the safety chilled water is then supplied by air-cooled chillers which provide the cooling function for the recirculation cooling units located in divisions one, two, three and four.

Loss of Coolant Accident

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In the event of a loss of coolant accident (LOCA), a containment isolation signal initiates isolation of the SB controlled areas from the supply to the SBVSE and the exhaust from the NABVS. Air is supplied from the SB controlled areas and exhausted through the SBVS iodine exhaust filtration trains (located in the FB) and discharged to the plant vent stack. To support the operation of plant equipment, recirculation cooling units maintain rooms in the SB controlled areas at ambient conditions.

In the event of a LOCA, the containment isolation signal initiates isolation of the FB from NABVS supply and exhaust duct to limit leakage into the FB. The SBVS maintains a negative pressure in the FB and exhaust air from the FB is directed to the SBVS iodine filtration trains (refer to Section 9.4.2).

Iodine Presence in the SB Rooms

In the event of a failed fuel element and residual heat removal pump seal leakage, high iodine is expected to be present in only one of the four divisions at a time, and it is necessary to purify the air in this division for personnel access. The air supply and exhaust flow for the affected division is increased to purge the possibly contaminated areas, while air supply and exhaust for the other three divisions is decreased. This is achieved by opening or closing the isolation dampers and partially opening the control dampers in order to maintain an acceptable total exhaust air flow to the NABVS iodine filtration train.

Fuel Handling Accident in the FB

In the event of a fuel handling accident in the FB, the exhaust air from the FB is processed through the SBVS iodine filtration trains located in the FB. The damper configuration is as follows:

- Associated dampers in the ducts from the FB to the SBVS filtered exhaust are in the open position.

- 10CFR 50.63, as it relates to the SBSVE because during a station blackout (SBO), two of the four SBs are backed up by the SBO diesel generators alternate AC (AAC) power. An analysis to determine capability for withstanding or coping with a station blackout event as described by RG 1.155, position C.3.2.4, will be performed. The safety chilled water system (SCWS) chillers which provide cooling to the division 1 and 4 SBVSE air coolers and recirculation units are also powered by the SBO diesels and are available.

The SBVSE maintains acceptable ambient conditions in the SB during SBO conditions. It ventilates the battery rooms in the SB during SBO conditions to maintain the hydrogen concentration below the maximum allowable limits of RG 1.128 (Reference 11) and IEEE Std 484 (Reference 10). The SBVSE also ventilates the SCWS rooms during SBO conditions to maintain the refrigerant concentration below the maximum allowable limits.

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During normal plant operation, the SBVSE supplies air to the SB controlled areas. The flow of air is automatically adjusted by a damper in the supply air ducting that receives a pressure control signal, which maintains a negative pressure in the SB controlled areas, relative to the outside environment. The SBVS maintains the SB Electrical Division at ambient pressure. With a negative pressure maintained in the SB controlled areas and an ambient pressure maintained in the SB Electrical Division, a clean air environment is sustained within the SB Electrical Division.

Following the receipt of a containment isolation signal, supply air to the SBVSE is automatically closed to maintain isolation between the clean areas of the SB Electrical Division and the potentially contaminated SB controlled areas.

The SB Electrical Division is maintained as a clean air environment. In the event of an RCP thermal barrier failure or if radiation is detected within the component cooling water system (CCWS), the SBVSE can be shut down and isolated from the main control room. The affected areas can then be isolated to prevent the potential release of contaminants.

The SCWS chillers which provide cooling to the division 1 and 4 SBVSE air coolers and recirculation units are also powered by the SBO diesels and are available.

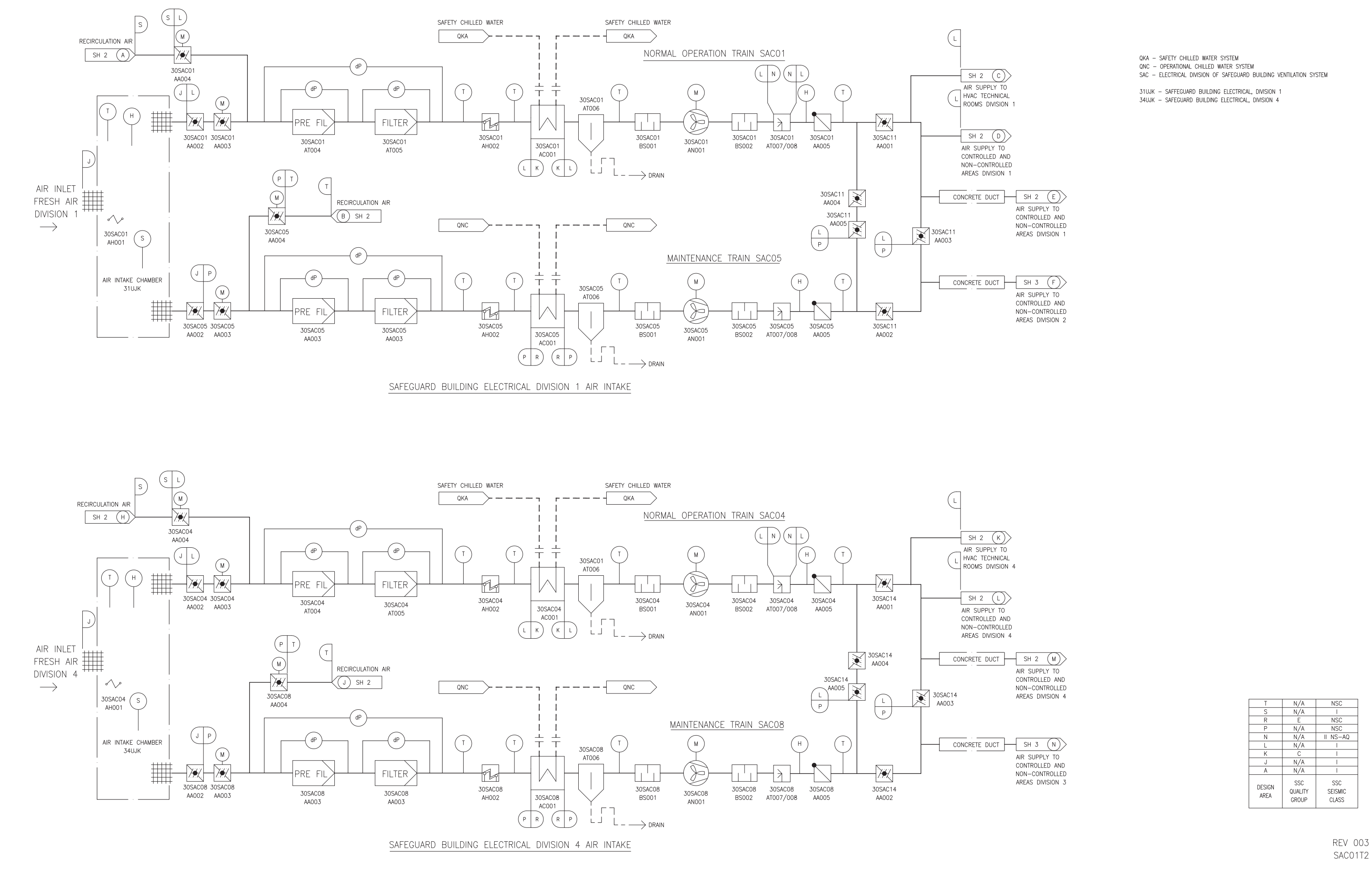
Air conditioning and heating loads for the SBVSE rooms are calculated using methodology identified in ASHRAE Handbook (Reference 3).

- Summer air conditioning loads will be 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 will be completed for both a normal and accident plant alignment configuration.

- The cooling supply units are designed to provide cooling as required to prevent the SBVSE room temperatures from exceeding their maximum design temperature.

Figure 9.4.6-1—Safeguard Building Electrical Divisions 1 and 4 Air Intake

09.04.05-3



DESIGN AREA	SSC QUALITY GROUP	SSC SEISMIC CLASS
T	N/A	NSC
S	N/A	I
R	E	NSC
P	N/A	NSC
N	N/A	II NS-AQ
L	N/A	I
K	C	I
J	N/A	I
A	N/A	I

filters are tested in accordance with the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standards (Reference 2). Cooling coils are hydrostatically tested in accordance with ASME AG-1 (Reference 1) and their performance is rated in accordance with the Air Conditioning and Refrigeration Institute (ARI) standards (Reference 10).

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 11), American Society of Mechanical Engineers, ASME N510 (Reference 3), ASME AG-1 (Reference 1), and RG 1.52 (Reference 12).

09.04.03-5

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 12), ASME N510 (Reference 3) and ASME AG-1 (Reference 1). The charcoal adsorber samples are tested for efficiency in accordance with RG 1.52 (Reference 12) and ASTM D3803 (Reference 13). Air filtration and adsorption unit heaters are tested in accordance with ASME N510 (Reference 3).

Internal carbon filtration units are tested 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 1.140 (Reference 14), ASME N510 (Reference 3) and ASME AG-1 (Reference 1). The charcoal adsorber samples are tested for efficiency in accordance with RG 1.140 (Reference 14) and ASTM D3803 (Reference 13). Air filtration and adsorption unit heaters are tested in accordance with ASME AG-1, Section CA (Reference 1).

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

In-service test program requirements are described per Ventilation Filter Test Program (VFTP) in Chapter 16, "Technical Specification" Section 5.5.10. ESF filtration unit testing will be completed at least once every 24 months.

9.4.7.4.1 Preoperational Tests

Refer to Section 14.2 (test abstracts #073, #075, #076, and #203) for initial plant startup test program. Initial in-place acceptance testing of CBVS components will be performed in accordance with ASME AG-1 (Reference 1), ASME N510 (Reference 3), and RG 1.52 (Reference 12).

09.04.03-5

Ductwork and Accessories

09.04.03-5

The supply and exhaust air ducts are structurally designed for fan shutoff pressures. The ductwork is designed, tested, and constructed in accordance with ASME N509 (Reference 11) and ASME N510 (Reference 3)

Supply Air Handling Units

Each of the two supply air handling units consists of a housing, a preheater, a heater, a cooler, a prefilter, and a filter. The outlets of the air handling units combine into a common duct that provides supply air to two parallel supply fans. The outlet of the two supply fans combine into a common duct with a supply air humidifier.

System Exhaust Air Handling Units

Each of the two exhaust air handling units consists of an airtight housing, a prefilter, a HEPA filter, a carbon adsorber, a HEPA post-filter, and motor operated inlet and outlet dampers. The outlets of both air handling units join into a single line and then separate to supply the inlets of the two parallel exhaust fans, allowing each air handling unit to supply either exhaust fan. Upstream of the two exhaust air handling units in the common duct are electric heaters to maintain proper air inlet temperature to the filtration system.

Room Exhaust Air Handling Units

Each of the five parallel room exhaust air filtration units consists of an air-tight housing, a prefilter, a HEPA filter, and the associated manual dampers. The manual dampers align the filter units to the room exhaust fans or the iodine filtration unit. These parallel air filtration units supply air to two parallel room exhaust fans. The units can also be aligned to a single room exhaust air iodine filtration unit.

Room Exhaust Air Iodine Filtration Unit

The room exhaust air iodine filtration unit consists of an air-tight housing, an electric air inlet heater, a carbon adsorber, a HEPA post-filter, and associated manual air dampers. The manual air dampers reroute air to the two parallel iodine filter booster fans, which supply air to the inlet of the room exhaust air fans.

Supply, System Exhaust, Room Exhaust, and Iodine Filter Unit Booster Fans

The supply, exhaust, and iodine filter unit booster fans are centrifugal type fans and are directly driven by the shaft of an electric motor. The fans are designed and rated in accordance with ANSI/AMCA 210 (Reference 4), ANSI/AMCA 211 (Reference 5), and ANSI/AMCA 300 (Reference 6).

09.04.03-5

Engineers, ASME N510 (Reference 3), ASME AG-1 (Reference 1), and RG 1.140 (Reference 8).

Heaters are tested in accordance with ASME AG-1, Section CA (Reference 1). Carbon filtration units are tested 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 1.140 (Reference 8), ASME N510 (Reference 3) and ASME AG-1 (Reference 1). The charcoal adsorber samples are tested for efficiency in accordance with RG 1.140 (Reference 8) and ASTM D3803 (Reference 10). Air filtration and adsorption unit heaters are tested in accordance with ASME AG-1, Section CA (Reference 1).

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

9.4.8.5 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 11.5.3.1.8 and Table 11.5-1, monitor/sample points R-20, R-21, R-22, and R-23 and R-24.

All instrumentation provided with the filtration units is as required by RG 1.140.

9.4.8.6 References

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

9.4.9 Emergency Power Generating Building Ventilation System

The emergency power generating building ventilation system (EPGBVS) maintains acceptable ambient conditions and air renewals of the diesel hall, electrical room, and main tank room of each of the four divisions of the Emergency Power Generating Buildings (EPGB). Each division has its own independent heating, ventilation and air conditioning (HVAC) system which is not connected to other divisions. Two divisions are located in each of the two EPGBs.

9.4.9.1 Design Bases

The EPGBVS is safety related and designed to meet Seismic Category I requirements. The EPGBVS performs the following safety-related system function and complies with the general design criteria (GDC) indicated below:

- The EPGBVS maintains acceptable temperatures and air renewals in each of the four divisions to support the operation of the emergency diesel generators (EDG) and electrical control panels. The EDGs are required to provide onsite emergency power for the safety-related equipment to achieve and maintain the plant in a safe shutdown condition following a design basis accident, including loss of offsite power (LOOP).

- In accordance with GDC 2, the EPGBVS components are located inside the EPGBs, which are designed to withstand the effects of natural phenomena, such as earthquakes, tornados, hurricanes, floods and external missiles.

- In accordance with GDC 4, the EPGBVS components remain functional and continue to perform their intended safety function after anticipated operational occurrences and design basis accidents, such as fire, internal missiles, or pipe breaks.

- In accordance with GDC 5, the safety-related components and systems of the EPGBVS are not shared with other nuclear power units.

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- In accordance with GDC 17, the U.S. EPR contains an onsite and offsite electric power system that supports the functioning of structures, systems, and components important to safety in the event of postulated accidents and anticipated operational occurrences. The EPGBVS maintains a minimum clearance of 20 feet from the bottom of fresh air intakes to grade elevation, and electrical cabinets are provided with suitable seals or gaskets. These features maintain proper functioning of the essential electric power system by meeting the guidelines of NUREG-CR/0660 (Reference 1), as related to the accumulation of dust and particulate material.

  The essential onsite electrical power systems meet the guidance of NUREG-CR/0660 for protection of essential electrical components (such as contactors, relays, circuit breakers) from failure due to the accumulation of dust and particulate materials. This is accomplished by the use of filters and supply air units in the EPGBVS.

The ABVS is designed with adequate instrumentation for differential pressure, temperature, and flow indicating devices to enable testing and verification of equipment function, heat transfer capability and air flow monitoring.

During normal plant operation, periodic testing of ABVS is performed to demonstrate system and component operability and integrity.

Isolation dampers are periodically inspected and damper seats replaced as required.

Fans are tested by the manufacturer in accordance with Air Movement and Control Association (AMCA) standards (References 5, 6, and 7). Air filters are tested in accordance with the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standards (Reference 8). Cooling coils are hydrostatically tested and their performance is rated in accordance with the Air Conditioning and Refrigeration Institute (ARI) standards (Reference 9).

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Housings and ductwork are leak-tested in accordance with ASME N510 (Reference 3), RG 1.140 (Reference 11), and the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) technical manual "HVAC Air Duct Leakage Test Manual" (Reference 10), American Society of Mechanical Engineers.

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

9.4.14.6 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 11.5.3.1.1 and Table 11.5-1, measurement point R-31.

9.4.14.7 References

1. UL 555, “Standard for Fire Dampers,” Underwriter’s Laboratories, Sixth Edition, June 1999.

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

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

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

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

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

7. ANSI/AMCA-300-1985, "Reverberant Room Method of Testing Fans for Rating Purposes," American National Standards Institute/Air Movement and Control Association International, December 1987.

8. 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.

9. ANSI/ ARI Standard 410-2001, "Forced-Circulation Air-Cooling and Air-Heating Coils," Air Conditioning and Refrigeration Institute, 2001.

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

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11. NRC Regulatory Guide 1.140, “Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Normal Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants,” 2001.

Next File

3.4 Perform air balance as appropriate for each subsystem.

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3.5 Verify that duct/housing total leakage requirements are met.

4.0 DATA REQUIRED

4.1 Operation of interlocks and set points.

4.2 Air balancing report, including fan operating data.

4.3 Containment building temperature data.

4.4 Prefilter, high efficiency particulate air (HEPA) filter, and carbon adsorber data for containment air clean up filtration units.

5.0 ACCEPTANCE CRITERIA

5.1 The CBVS perform as designed (refer to Section 9.4.7):

5.1.1 Containment Building cooling alarms, interlocks, protective devices, and controls (manual and automatic) function as designed.

5.1.2 Containment Building cooling fan performance meets design requirements.

5.1.3 Containment Building cooling dampers/valve performance (i.e., thrust, opening times, closing times, and ability to control flow) meets design requirements.

5.1.4 Containment Building cooling air balance meets design requirements.

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5.1.5 Containment Building meets duct/housing total leakage requirements.

14.2.12.8.2 Containment Building Cooling Subsystem (Test #074)

1.0 OBJECTIVE

1.1 To verify the proper operation of the containment building cooling subsystem. This system provides cool air to the reactor coolant pumps (RCP), steam generators (SG), chemical and volume control system (CVCS), control rod drive mechanism (CRDM) system and vent and drain system.

2.0 PREREQUISITES

2.1 Construction activities on the containment building cooling subsystem are complete.

2.2 Permanently installed instrumentation is functional and calibrated and is operating satisfactorily prior to performing the following test.

2.3 Test instrumentation is available and calibrated.

2.4 Plant systems required to support testing are functional.

3.9 For separate HVAC units check electrical independence and redundancy of power supplies for safety-related functions by selectively removing power and determining loss of function.

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3.10 Verify that duct/housing total leakage requirements are met.

4.0 DATA REQUIRED

4.1 Damper operating data.

4.2 Air flow and balancing verification.

4.3 Setpoints at which alarms, center backs and control occur.

4.4 Temperature data for each of the SBVSE.

5.0 ACCEPTANCE CRITERIA

5.1 The SBVSE operates as designed (refer to Section 9.4.6):

5.1.1 Safeguard Building cooling alarms, interlocks, protective devices, and controls (manual and automatic) function as designed.

5.1.2 Safeguard Building cooling fan performance meets design requirements.

5.1.3 Safeguard Building cooling dampers/valve performance (thrust, opening times, closing times, and ability to control flow) meets design requirements.

5.1.4 Safeguard Building cooling air balance meets design requirements.

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5.1.5 SBVSE meets duct/housing total leakage requirements.

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

14.2.12.8.7 Nuclear Auxiliary Building Ventilation System (Test #079)

1.0 OBJECTIVE

1.1 To demonstrate the operation of the nuclear auxiliary building ventilation system (NABVS).

1.2 To demonstrate electrical independence and redundancy of power supplies.

2.0 PREREQUISITES

2.1 Construction activities in the nuclear auxiliary building are complete with penetrations sealed.

2.2 Construction activities on the NABVS have been completed.

2.3 NABVS instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.4 Support systems required for operation of the NABVS are functional.

2.5 Test instrumentation is available and calibrated.

3.0 TEST METHOD

3.1 Verify control logic.

3.2 Verify the operation of the air handling units or fans or both.

3.3 Verify alarms, indicating lights and status lights are functional.

3.4 Perform air flow balancing of the NABVS.

3.5 Verify that operation of dampers meets design requirements.

3.6 Perform HEPA filter and carbon adsorber efficiency tests.

3.7 Verify operation of the NABVS radioactivity monitors (refer to Table 11.5-1, Monitors R-11 through R-15).

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

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3.9 Verify that duct/housing total leakage requirements are met.

4.0 DATA REQUIRED

4.1 Damper operating data.

4.2 Air flow and balancing verification.

4.3 Setpoints at which alarms and control occur.

4.4 Temperature data for each of the NABVS.

4.5 HEPA filter and carbon adsorber efficiency data.

5.0 ACCEPTANCE CRITERIA

5.1 The NABVS operates as designed (refer to Section 9.4.3):

5.1.1 NABVS alarms, interlocks, protective devices, and controls (manual and automatic) function as designed.

5.1.2 NABVS fan performance meets design requirements.

5.1.3 NABVS dampers/valve performance (i.e., thrust, opening times, closing times, and ability to control flow) meets design requirements.

5.1.4 NABVS air balance meets design requirements.

5.1.5 The NABVS meets design requirements to monitor radiation (refer to Table 11.5-1, Monitors R-11 through R-15).

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5.1.6 NABVS meets duct/housing total leakage requirements.

14.2.12.8.8 Radioactive Waste Building Ventilation System (Test #080)

1.0 OBJECTIVE

1.1 To demonstrate the proper operation of the radioactive waste building ventilation system (RWBVS) to maintain design condition.

2.0 PREREQUISITES

2.1 Construction activities on the RWBVS have been completed.

2.2 RWBVS instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.3 Support systems required for operation of the RWBVS are complete and functional.

2.4 Test instrumentation is available and calibrated.

3.0 TEST METHOD

3.1 Verify control logic.

3.2 Verify that operation, stroking speed and position indication of dampers meets design requirements.

3.3 Verify the capacity of the HVAC system to maintain the area temperature.

3.4 Verify the system maintains the Radioactive Waste Processing Building at a negative pressure.

3.5 Verify that operation of the general ventilation supply units and fans meets design requirements.

3.6 Verify that operation of the general ventilation exhaust units and fans meets design requirements.

3.7 Perform HEPA filter and carbon adsorber efficiency tests.

3.8 Verify the systems rated air flow and air balance.

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

3.10 Verify that operation of the RWBVS response to high radiation monitor signal meets design requirements (refer to Table 11.5-1, Monitors R-20 and R-22).

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3.11 Verify that duct/housing total leakage requirements are met.

4.0 DATA REQUIRED

4.1 Air balancing verification.

4.2 Fan and damper operating data.

4.3 Temperature data.

4.4 Setpoints of alarms interlocks and controls.

4.5 The Radioactive Waste Building negative pressure readings.

4.6 RWBVS performance data in response to radiation monitor signals.

4.7 HEPA filter and carbon adsorber efficiency data.

5.0 ACCEPTANCE CRITERIA

5.1 The RWBVS operates as designed (refer to Section 9.4.8):

5.1.1 RWBVS alarms, interlocks, protective devices, and controls (manual and automatic) function as designed.

5.1.2 RWBVS fan performance meets design requirements.

5.1.3 RWBVS dampers/valve performance (i.e., thrust, opening times, closing times, and ability to control flow) meets design requirements.

5.1.4 RWBVS air balance meets design requirements.

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5.1.5 RWBVS meets duct/housing total leakage requirements.

5.2 The RWBVS responds as designed to radiation monitor signals designed (refer to Table 11.5-1, Monitors R-20 through R-22).

14.2.12.8.9 Fuel Building Ventilation System (Test #081)

1.0 OBJECTIVE

1.1 To demonstrate the proper operation of the fuel building ventilation system (FBVS) to maintain design conditions.

1.2 To demonstrate electrical independence and redundancy of power supplies.

2.0 PREREQUISITES

2.1 Construction activities on the FBVS have been completed.

2.2 FBVS instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.3 Support systems required for operation of the FBVS are complete and functional.

2.4 Test instrumentation is available and calibrated.

3.0 TEST METHOD

3.1 Verify control logic.

3.2 Verify that operation, stroke speed and position indication of dampers meet design requirements.

3.3 Verify the system maintains the Fuel Building at a negative pressure.

3.4 Verify the NABVS supplies and exhausts air to the Fuel Building.

3.5 Verify that the operation of the fuel handling area ventilation exhaust units and fans meet design requirements.

3.6 Verify that operation of the heating and cooling units meet design requirements.

3.7 Verify HEPA filter efficiency, carbon adsorber efficiency, and air flow capacity.

3.8 Verify the systems rated air flow and air balance.

3.9 Verify that operation of protective devices, controls, interlocks instrumentation, and alarms using actual or simulated inputs.

3.10 Verify system response to a high radiation signal (refer to Table 11.5-1, Monitors R-17, R-18, and R-19)).

3.11 Verify that operation of the FBVS radiation monitors meet design requirements (refer to Table 11.5-1, Monitors R-17, R-18, and R-19).

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

09.04.03-5

3.13 Verify that duct/housing total leakage requirements are met.

4.0 DATA REQUIRED

4.1 Air balancing verification.

4.2 Fan and damper operating data.

4.3 Temperature data in the Fuel Building.

4.4 Setpoints at which alarms, interlocks, and controls occur.

4.5 Fuel Building negative pressurization data during normal and postulated emergency conditions.

4.6 Filter and carbon adsorber data.

4.7 FBVS performance data in response to radiation monitor signals.

5.0 ACCEPTANCE CRITERIA

5.1 The FBVS operates as designed (refer to Section 9.4.2):

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

5.1.2 FBVS valves and dampers function as design.

5.1.3 FBVS maintains the Fuel Building at the required negative pressure.

- Table 14.3-2 Item 2-9.

5.1.4 FBVS recirculation rate (e.g., through the HEPA filters, carbon adsorber) meet design requirements.

5.1.5 FBVS normal operation heating and ventilation system performs as designed.

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5.1.6 FBVS meets duct/housing total leakage requirements.

5.2 The FBVS responds to radiation monitor signals as designed (refer to Table 11.5-1, Monitors R-17, R-18, and R-19).

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

14.2.12.8.10 Main Control Room Air Conditioning System (Test #082)

1.0 OBJECTIVE

1.1 To verify that operation of the main control air conditioning system (CRACS) establishes that a proper environment for personnel and equipment under postulated conditions in the following areas:

1.1.1 MCR.

1.1.2 Technical Support Center.

1.1.3 Other offices and equipment areas of the control room envelope (CRE).

1.2 To demonstrate electrical independence and redundancy of power supplies.

2.0 PREREQUISITES

2.1 Construction activities in the MCR complex have been completed and penetrations sealed.

2.2 Construction activities on the CRACS have been completed.

2.3 The CRACS system instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.4 Support systems required for operation of the CRACS are complete and functional.

2.5 Test instrumentation is available and calibrated.

3.0 TEST METHOD

3.1 Verify control logic.

3.2 Verify that operation, stroke speed and position indication of dampers meet design requirements.

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.

3.4.2 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 Demonstrate the operation of the battery room exhaust fans.

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

3.10 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).

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

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3.12 Verify that duct/housing leakage requirements are met.

4.0 DATA REQUIRED

4.1 Air balancing verification.

4.2 Fan and damper operating data.

4.3 Temperature data in the CRE.

4.4 Response to radioactivity 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.

5.1.2 CRACS valves and dampers function as design.

5.1.3 CRACS responds as designed to a simulated 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.

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5.1.8 CRACS meets duct/housing total leakage requirements.

5.2 The CRACS radiation monitors perform as designed (refer to 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.

2.0 PREREQUISITES

2.1 Construction activities in the safeguard building mechanical area are complete with penetrations sealed.

2.2 Construction activities on the SBVS have been completed.

2.3 Safeguard building mechanical area ventilation subsystem instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.4 Support systems required for operation of the SBVS are functional.

2.5 Test instrumentation is available and calibrated.

3.0 TEST METHOD

3.1 Verify control logic.

3.2 Verify the operation of air handling units or fans or both.

3.3 Verify operation of the operational air exhaust mode in the mechanical area.

3.4 Verify operation of the accident air exhaust mode in the mechanical area.

3.5 Verify operation of the electric air convectors (area heaters).

3.6 Verify operation of the filter air heaters, prefilters, HEPA filters, and adsorbers.

3.7 Verify operation of the recirculation cooling units.

3.8 Verify alarms, indicating lights and status lights are functional.

3.9 Perform air flow balancing of the SBVS.

3.10 Verify that operation of dampers meet design requirements.

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

3.12 Verify that operation of the SBVS radiation monitors meet design requirements (refer to Table 11.5-1, Monitors R-25 and R-26).

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3.13 Verify that duct/housing leakage requirements are met.

4.0 DATA REQUIRED

4.1 Damper operating data.

4.2 Air flow and balancing verification.

4.3 Setpoints at which alarms, center backs and control occur.

4.4 Temperature data for each of the SBVS.

5.0 ACCEPTANCE CRITERIA

5.1 The SBVS operates as designed (refer to Section 9.4.5):

5.1.1 SBVS air handlers/fans perform as designed.

5.1.2 The operation of the SBVS operational air exhaust mode in the mechanical area meets design requirements.

5.1.3 The operation of the SBVS accident air exhaust mode in the mechanical area meets design requirements.

5.1.4 The operation of the SBVS electric air convectors (area heaters) meets design requirements.

5.1.5 The operation of the SBVS filter air heaters, prefilters, HEPA filters, and adsorber meets design requirements.

5.1.6 The operation of the SBVS recirculation cooling units meets design requirements.

5.1.7 SBVS alarms, indicating lights and status lights meet design requirements.

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5.1.8 SBVS meets duct/housing total leakage requirements.

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

5.3 The SBVS meets design requirements to monitor radiation (refer to Table 11.5-1, Monitors R-25 and R-26).

14.2.12.8.12 Emergency Power Generating Building Ventilation System (Test #084)

1.0 OBJECTIVE

1.1 To demonstrate proper operation of the emergency power generating building ventilation system (EPGBVS).

1.2 To demonstrate proper operation of the EPGBVS.

1.3 To demonstrate electrical independence and redundancy of power supplies.

2.0 PREREQUISITES

2.1 Construction activities on the EPGBVS have been completed.

2.2 EPGBVS instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.3 Support systems required for operation of the EPGBVS are complete and functional.

2.4 Test instrumentation is available and calibrated.

3.0 TEST METHOD

3.1 Verify control logic.

3.2 Verify design air flow with each EPGBVS in operation.

3.3 Verify design temperature can be maintained in each Emergency Power Generating Building.

3.4 Verify alarms, indicating instruments, and status lights are functional.

3.5 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 Fan and damper operating data.

4.2 Air flow verification

4.3 Setpoint at which alarms, interlocks, and controls occur.

4.4 Temperature data of each Emergency Power Generating Building.

3.6 Perform vendor supplied startup checks and calibrations for all laboratory equipment that analyze or measure isotopic concentrations of radioactive samples.

4.0 DATA REQUIRED

4.1 Inspection report from verification of laboratory equipment drains.

4.2 Inspection report from verification of ventilation hood flow and routing.

4.3 Completed vendor specified laboratory equipment startup procedures.

5.0 ACCEPTANCE CRITERIA

5.1 The laboratory equipment drain interface with the plant systems performs as designed.

5.2 The laboratory equipment ventilation hood interface with the plant systems performs as designed.

5.3 The laboratory equipment checkout and calibration procedures meet design requirements as described in Sections 11.5 and 13.4.

14.2.12.8.19 Access Building Ventilation System (Test #224)

1.0 OBJECTIVE

1.1 To verify the access building ventilation system (ABVS) can maintain the space temperature as required.

1.2 To verify that radiological alarms are provided in the control room for the operator to manually isolate the building exhaust to the vent stack (refer to Section 11.5.3.1.2 and Table 11.5-1, Monitor R-31..

2.0 PREREQUISITES

2.1 Construction activities on the ABVS have been completed.

2.2 ABVS instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.3 Support systems required for operation of the ABVS are complete and functional.

2.4 Test Instrumentation is available and calibrated.

3.0 TEST METHOD

3.1 Verify control logic and interlock.

3.2 Verify design air flow of each fan.

3.3 Verify alarms, indicating instruments and status lights are functional.

3.4 Verify design temperatures can be maintained in the structure.

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3.5 Verify that duct/housing leakage requirements are met.

4.0 DATA REQUIRED

4.1 Temperature data for the structure from each HVAC unit.

4.2 HVAC unit operating data.

4.3 Setpoints at which alarms and interlocks occur.

5.0 ACCEPTANCE CRITERIA

5.1 The ABVS operates as designed (refer to Section 9.4.14, Section 11.5.3.1.10 and Table 11.5-1, Monitor R-31):

5.1.1 ABVS alarms, interlocks, protective devices, and controls (manual and automatic) function as designed.

5.1.2 ABVS fan performance meets design requirements.

5.1.3 ABVS dampers/valve performance (i.e., thrust, opening times, closing times, and ability to control flow) meets design requirements.

5.1.4 ABVS air balance meets design requirements.

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5.1.5 ABVS meets duct/housing total leakage requirements.

14.2.12.9 Auxiliary Systems

14.2.12.9.1 Leak-off System (Test #091)

1.0 OBJECTIVE

1.1 To demonstrate the functionality of the leak-off system (LOS) to collect and route bypass leakage from selected penetrations in the Containment Building containing primary fluid to the annulus sump.

1.2 To demonstrate the functionality of the LOS to provide a flow path for inflating/deflating the containment in support of ILRT.

1.3 To demonstrate the functionality of the LOS to provide a flow path for measuring leak tightness of the containment in support of ILRT.

2.0 PREREQUISITES

2.1 Construction activities on the LOS have been completed.

2.2 LOS instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.3 Support systems required for operation of the LOS are completed and functional.

3.0 TEST METHOD

3.1 Verify the bypass leakage flow path from the personnel air locks to the annulus sump.