ArevaEPRDCDocsPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Thursday, May 23, 2013 9:02 PM
To: Snyder, Amy
Cc: Clark, Phyllis; ANDERSON Katherine (EXTERNAL AREVA); DELANO Karen (AREVA); HONMA George (EXTERNAL AREVA); LEIGHLITER John (AREVA); LEWIS Ray (EXTERNAL AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); SHEPHERD Tracey (AREVA); VANCE Brian (AREVA); KANE Steve (EXTERNAL AREVA); GORDON Darryl (AREVA); RITCHEY Calvin (AREVA); NOXON David (AREVA)
Subject: Advanced Response to U.S. EPR Design Certification Application RAI No. 529 (6178), FSAR Ch. 12, Question 12.03-12.04-28
Attachments: Advanced Response to RAI 529 Question 12.03-12.04-28 US EPR DC.pdf

Amy,

Attached is an Advanced Response for RAI 529, Question 12.03-12.04-28 in advance of the June 28, 2013 final date.

To keep our commitment to send a final response to this question by the commitment date, we need to receive all NRC staff feedback and comments no later than **June 14, 2013**.

Please let me know if NRC staff has any questions or if the response to this question can be sent as final.

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: Wednesday, May 08, 2013 5:02 PM
To: Amy.Snyder@nrc.gov
Cc: phyllis.clark@nrc.gov; ANDERSON Katherine (External AREVA NP INC.); DELANO Karen (RS/NB); LEIGHLITER John (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); KANE Steve M (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 529 (6178), FSAR Ch. 12, Question 12.03-12.04-28 - STATUS

Amy,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to the one question in RAI No. 529 on January 17, 2012. Supplement 1 was submitted to the NRC on February 26, 2012 to provide a revised schedule for the final response to this question.

As provided in letter NRC:13:012 dated April 12, 2013, AREVA provided a schedule for an Advanced Response to RAI 529, Question 12.03-12.04-28 of May 8, 2013 with a final response of June 28, 2013. The schedule for the final response to this question remains unchanged. A revised schedule for the Advanced Response to RAI 529, Question 12.03-12.04-28 is provided below:

Question #	Advanced Response Date	NRC Comment Request Date	Final Response Date
RAI 529 — 12.03-12.04-28	**May 24, 2013**	**June 14, 2013**	June 28, 2013

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: Sunday, February 26, 2012 7:45 PM
To: Getachew.Tesfaye@nrc.gov
Cc: 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. 529 (6178), FSAR Ch. 12, Supplement 1

AREVA NP Inc. provided a schedule for a technically correct and complete response to the one question in RAI No. 529 on January 17, 2012.

The schedule for a response to this question has been changed as provided below. This schedule was transmitted to the NRC in AREVA NP letter NRC:12:008 dated February 21, 2012.

Question #	Response Date
RAI 529 — 12.03-12.04-28	**June 28, 2013**

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 (CORP/QP)
Sent: Tuesday, January 17, 2012 4:05 PM
To: Tesfaye, Getachew

Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); NOXON David (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 529 (6178), FSAR Ch. 12

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 529 Response US EPR DC.pdf," provides a schedule since a technically correct and complete response to the one question cannot be provided at this time.

The following table indicates the respective pages in the response document, "RAI 529 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 529 — 12.03-12.04-28	2	3

A preliminary revised schedule for a technically correct and complete response to the one question is provided below. This schedule is being reevaluated and a new supplement with a revised schedule will be transmitted by February 21, 2012.

Question #	Response Date
RAI 529 — 12.03-12.04-28	February 21, 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
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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Thursday, December 08, 2011 11:03 AM
To: ZZ-DL-A-USEPR-DL
Cc: Dehmel, Jean-Claude; Schaaf, Robert; Clark, Phyllis; Segala, John; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 529 (6178), FSAR Ch. 12

Attached please find the subject request for additional information (RAI). A draft of the RAI was provided to you on November 25, 2011, and on December 7, 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, excluding the time period of **December 24, 2011 thru January 2, 2012, to account for the holiday season** as discussed with AREVA NP Inc. For any RAIs that cannot be answered **within 40 days**, it is expected that a date for receipt of this information will be provided to the staff within the 40-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_Docs_Public
Email Number: 3

Mail Envelope Properties (554210743EFE354B8D5741BEB695E65616A87A)

Subject: Advanced Response to U.S. EPR Design Certification Application RAI No. 529 (6178), FSAR Ch. 12, Question 12.03-12.04-28
Sent Date: 5/23/2013 9:01:55 PM
Received Date: 5/23/2013 9:02:02 PM
From: WILLIFORD Dennis (AREVA)

Created By: Dennis.Williford@areva.com

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Options
Priority: Standard
Return Notification: No

Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Advanced Response to

Request for Additional Information No 529, Question 12.03-12.04-28

12/08/2011

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 12.03-12.04 - Radiation Protection Design Features
Application Section: 12.3 with system interfaces in Sections 11.5 and 14.2.12

QUESTIONS for Health Physics Branch (CHPB)

Question 12.03-12.04-28:

OPEN ITEM

Supplemental question to responses on RAI 273, Questions No. 11.05-2, 11.05-5, 11.05-7, 11.05-8, 11.05-9, and 11.05-10 and RAI 405, Question 11.05-24. Based on a review of Revision 3 of the U.S. EPR FSAR and the FSAR mark up provided in the response to RAI 273, the staff has identified the following items to be addressed and resolved in the stated FSAR sections that are related to Chapter 12, radiation protection:

a. FSAR Tier 2, Table 12.3-3 lists the high range activity monitors inside containment as having the following accident function: “Signals Reactor Building air filtration isolation and RHR valve closure.” This information is not consistent with FSAR Section 12.3.4.1.3. Revise FSAR Table 12.3.4.1.3 and/or Table 12.3-3 so that they are consistent about what the containment high range monitors’ accident functions are.

b. FSAR Tier 2, Table 12.3-4 refers the reader to R-10 when talking about airborne monitors located inside the reactor building. However, it is not clear how R-10 can be located both inside the exhaust containment ventilation and on the refueling machine (used during spent fuel movement) as stated in FSAR Table 12.3-4. Please revise or correct this reference.

c. FSAR Tier 2, Table 12.3-4 refers the reader to R-19 when speaking about aerosol and iodine monitors located inside the Nuclear Auxiliary Building. However, FSAR Table 11.5-1 does not list R-19 as an aerosol or an iodine monitor, only as a noble gas monitor. Please revise FSAR Table 12.3-4 and/or Table 11.5-1 as necessary so that they are consistent.

d. Regarding FSAR Tier 2, Section 14.2.12.11.19 (Radiation Monitoring System Test No 143) under Test Method, Step 3.1 refers to Table 11.5-1. However check sources should be used to verify operation of all area radiation monitors also, not just the process monitors located in FSAR Table 11.5-1. Therefore revise the wording to also refer to Table 12.3-3 in addition to Table 11.5-1.

e. Regarding FSAR Tier 2, Section 14.2.12.11.19 (RMS Test No 143) under Acceptance Criteria, Step 5.1 states that the Main Control Room air intake duct activity measurement signal is input to the protection system. However, FSAR Section 11.5.3.1.11 that discusses this monitor does not mention that it provides input to the protection system. Please revise the FSAR as necessary to ensure consistency.

f. Regarding FSAR Tier 2, Section 14.2.12.11.19 (RMS Test No 143) under Acceptance Criteria, Step 5.2 refers the reader to “Monitors R-55 through 5-58”. Monitors R-55 through R-58 are the main steam line monitors, However, Step 5.2 is talking about the containment high range activity monitors which are listed in Table 12.3-3. Please revise step 5.2 so that it references FSAR Table 12.3-3 instead of Chapter 11 (and monitors R-55 through 5-58).

g. In FSAR Tier 2, Section 14.2.12.11.19, RMS Test No 143 acceptance criteria 5.1 and 5.2 state that the monitors will have to provide input to the protection system. However, the acceptance criteria for these monitors should be that the radiation signals to the

monitors result in control actuations that meet design requirements. Please revise these acceptance criteria accordingly.

h. In the RAI 273 Supplement 16 response the FSAR mark-up shows FSAR Tier 2, Section 6.2.4.2.2 has been changed to refer the reader to Section 12.3 and Table 12.3-4 for information on area radiation monitors that provide a containment isolation signal on high radiation. The reference to FSAR Table 12.3-4 is incorrect; this should say Table 12.3-3.

i. In the RAI 273 Supplement 16 response, FSAR Tier 1, Table 2.6.4-3 was revised so that it read "Upon receipt of a containment isolation signal in the reactor building, the FB is isolated from the NABVS…" However, FSAR Tier 2, Section 9.4.2.2.3 says that "in the event of a LOCA, the containment isolation signal or a radiation signal in the RB initiates isolation of the FB from NABVS supply and exhaust duct to limit leakage to the FB." Please revise Tier 1 and Tier 2 so that they are consistent with respect to what triggers isolation of the FB from NABVS.

Response to Question 12.03-12.04-28:

Item a:

The containment high range radiation monitors send a signal to the Protection System to initiate Stage 1 Containment Isolation. The correct function is listed in U.S. EPR FSAR Tier 2, Section 12.3.4.1.3, Initiate Stage 1 Containment Isolation on high range radiation monitor signal inside the Reactor Building. The automatic control function listed in U.S. EPR FSAR, Tier 2, Table 12.3-3, for the Reactor Building will be revised to:

Initiate Stage 1 Containment Isolation on high range radiation monitor signal inside the Reactor Building.

Item b:

The first entry for the noble gas monitor in U.S. EPR FSAR Tier 2, Table 12.3-4, Sheet 1 of 4, will be revised to delete the reference to monitoring point R-10. The remaining three entries (i.e., noble gas monitor, aerosol monitor, and gaseous iodine monitor) in the exhaust from containment ventilation (upstream KLA05 filters) correctly reference monitoring point R-10.

Item c:

U.S. EPR FSAR Tier 2, Table 12.3-4, Sheet 3 of 4, will be revised to eliminate the references to monitoring point R-19 from the noble gas, aerosol, and iodine entries for the Nuclear Auxiliary Building.

Item d:

Each radiation detector will contain a built-in check source that is actuated from the associated local electronic unit. The check source is used to verify detector operation. U.S. EPR FSAR Tier 2, Section 14.2.12.11.19 (Radiation Monitoring System Test # 143), will be revised to reference Tables 11.5-1, 12.3-3, and 12.3-4 to specify the correct scope of the radiation monitors to be tested.

Item e:

U.S. EPR FSAR Tier 2, Section 14.2.12.11.19 (RMS Test No 143), Acceptance Criteria, Step 5.1, will be modified in the response to RAI 527, Question 14.02-163(g). The Acceptance Criteria will be deleted, which states that "The radiation monitoring system (MCR air intake duct activity) generates a Main Control Room air intake activity measurement signal as input to the protection system (refer to Table 12.3-3),".

Item f:

U.S. EPR FSAR Tier 2, Section 14.2.12.11.19 (RMS Test No 143), Acceptance Criteria, Step 5.2, will be modified in the response to RAI 527, Question 14.02-163(g). The Acceptance Criteria will be deleted, which states that "The radiation monitoring system (containment high range activity) generates a containment isolation signal as an input to the PS, as designed (refer to Section 11.5.4.1 and Table 11.5-1, Monitors R-55 through 5-58).". Step 3.5 of this test discusses the containment high range radiation monitors and references U.S. EPR FSAR Tier 2, Table 12.3-3.

Item g:

As discussed in the responses to items e. and f., U.S. EPR FSAR Tier 2, Section 14.2.12.11.19 (RMS Test No 143), Acceptance Criteria, Steps 5.1 and 5.2 will be deleted in the response to RAI 527, Question 14.02-163(g). The following text will be added to Section 14.2.12.11.19, Subsection 5.0, as part of the response to RAI 527:

> Radiation monitoring instrumentation meets design requirements to monitor radiation and initiate Automatic Control Functions upon detection of high activity levels.

Item h:

U.S. EPR FSAR Tier 2, Section 6.2.4.2.2 will be revised to reference Table 12.3-3 instead of Table 12.3-4.

Item i:

U.S. EPR FSAR Tier 1, Table 2.6.4-3, Item 7.2 includes the following Commitment Wording:

> "Upon receipt of a containment isolation signal, the FBVS isolation dampers identified in Table 2.6.4-1 realign to exhaust air to the SBVS iodine filtration exhaust to the plant vent stack."

This is consistent with text in U.S. EPR FSAR Tier 2, Section 9.4.2.2.3 of, Interim Revision 5, Page 9.4-27, which states:

> "Upon receipt of a containment isolation signal, the following functions are initiated automatically:
>
> - Closes FBVS exhaust air isolation dampers to NABVS.
> - Closes FBVS supply air isolation dampers from NABVS.

- Opens FBVS exhaust air isolation dampers to exhaust air from the entire Fuel Building to the SBVS.
- Opens isolation dampers for the SBVS Accident Exhaust Iodine Filtration Trains.
- Starts SBVS iodine filtration train fans to pull air through SBVS Accident Exhaust Iodine Filtration Trains and to direct exhaust air to the vent stack. The SBVS maintains negative pressure in the Fuel Building."

These sections are consistent and no changes to the U.S. EPR FSAR are required.

FSAR Impact:

U.S. EPR FSAR, Tier 2, Sections 6.2.4.2.2 and 14.2.12.11.19 and Tables 11.5-1, 12.3-3 and 12.3-4, will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

Certain containment isolation valves in systems required for accident mitigation do not receive a containment isolation actuation signal because their systems are required for accident mitigation. However, the containment isolation function may be required postaccident; therefore, the valves can be closed remotely from the main control room (MCR).

The four safety injection system trains draw suction from the in-containment water storage tank (IRWST). These suction lines each contain only one remotely operated isolation valve located outside the containment. The isolation valves do not receive an automatic containment isolation signal. Rather, the valves remain open during a postulated accident to support the safety injection function. The section of piping located between the IRWST and each isolation valve is contained in a guard pipe, thus providing a double leak-tight penetration barrier. This arrangement provides a higher level of safety than the standard isolation valve arrangement. The SIS outside containment is protected from missiles and seismic events, is constructed to Quality Group B and Seismic Category I standards, and has a design temperature and pressure rating equal to that of the containment. The IRWST is provided with sump screens to prevent debris entrainment into the SIS, as described in Section 6.3.2.5.

The containment building ventilation system (CBVS) includes purge lines that connect directly to the containment atmosphere, as described in Section 9.4.7. Area radiation monitors provide a containment isolation signal on high radiation (see Section 12.3 and Table 12.3-34).

The severe accident heat removal system (SAHRS) draws suction from the IRWST. The piping inside containment is embedded in concrete and the penetration piping is protected by a guard pipe. Two remotely operated isolation valves outside containment receive an automatic containment isolation signal to close. An identical arrangement exists for the suction line from the IRWST to the chemical and volume control (CVCS) charging pumps.

The positions of the individual containment isolation valves depend on the plant's operating mode, and on the specific fluid system's functional requirements for that mode. The positions of each containment isolation valve under normal and accident conditions are listed in Table 6.2.4-1.

6.2.4.2.3 Closed System Isolation Valves

Lines that penetrate the containment and are neither part of the RCPB nor connected directly to the containment atmosphere have at least one isolation valve that is located outside the containment. The isolation valve is either automatic, or locked closed, or capable of remote manual operation. For these lines, simple check valves are not used as automatic isolation valves. The containment isolation valves of these systems provide the capability to detect leakage from the valve shaft or bonnet seals.

Table 12.3-3—Radiation Monitor Detector Parameters
Sheet 3 of 3

Monitor Location	Monitor Provisions		Range
	Continuous	ACF	
Reactor Building	4 monitors inside containment – Service Compartment	Initiates Stage 1 Containment Isolation on high radiation monitor signal inside the Reactor Building~~Signals Reactor Building air filtration isolation and RHR valve closure~~	1E-1 – 1E+7 rad/hr
Radioactive Waste Processing Building	1 monitor – In the drumming room next to conveyor	---	1E-4 – 1E+4 rem/hr
	1 monitor – In the decontamination room	---	1E-4 – 1E+4 rem/hr

Table 12.3-4—Airborne Radioactivity Detector Parameters
Sheet 1 of 4

Monitor Location	Monitor Provisions		Range[1]
	In-Process Continuous	ACF	
Reactor Building	1 noble gas monitor at ~~(R-10)~~ refueling machine (used during spent fuel movement only)	---	1E-6 – 1E-2 µCi/cc (Kr-85, Xe-133)
	1 noble gas monitor (R-10) in exhaust containment ventilation (upstream KLA05 filters)	---	3E-7 – 1E-2 µCi/cc (Kr-85, Xe-133)
	1 aerosol monitor (R-10) in exhaust from containment ventilation (upstream KLA05 filters)	---	5E-4 – 3E+0 µCi 3E-10 – 1E-6 µCi/cc Must be capable of detecting 10 DAC-hours
	1 gaseous iodine monitors (R-10) in exhaust from containment ventilation (upstream KLA05 filters)	---	5E-4 – 3E+0 µCi 3E-10 – 5E-8 µCi/cc (I-131) Must be capable of detecting 10 DAC-hours
Fuel Building (Figure 12.3-73)	1 noble gas monitor (R-7) in exhaust air of containment ventilation (upstream KLA2 filters)	---	3E-7 – 1E-2 µCi/cc (Kr-85, Xe-133)
	1 aerosol monitor (R-7) in exhaust air of containment ventilation (upstream KLA2 filters)	---	5E-4 – 3E+0 µCi 3E-10 – 1E-6 µCi/cc Must be capable of detecting 10 DAC-hours

Table 12.3-4—Airborne Radioactivity Detector Parameters
Sheet 3 of 4

Monitor Location	Monitor Provisions		Range[1]
	In-Process Continuous	ACF	
Nuclear Auxiliary Building (Figure 12.3-74)	6 aerosol monitors in exhaust air from exhaust cells of Safeguard Building and Nuclear Auxiliary Building, Fuel Building (upstream KLE Filtration)	See Table 11.5-1, Monitors R-11, R-12, and R-13 (NABVS Cells 1-3), R-25 (SBVS Cell 6), R-17 and R-18 (FBVS Cells 4 and 5)~~, and R-19 (Fuel Handling Area Ventilation (Cell 5))~~	5E-4 – 3E+0 µCi 3E-10 – 1E-6 µCi/cc Must be capable of detecting 10 DAC-hours
	6 noble gas monitors in exhaust air from exhaust cells of Safeguard Building and Nuclear Auxiliary Building, Fuel Building (upstream KLE Filtration)	See Table 11.5-1, Monitors R-11, R-12, and R-13 (NABVS Cells 1-3), R-25 (SBVS Cell 6), R-17 and R-18 (FBVS Cells 4 and 5)~~, and R-19 (Fuel Handling Area Ventilation (Cell 5))~~	3E-7 – 1E-2 µCi/cc (Kr-85, Xe-133)
	6 gaseous iodine monitors in exhaust air from exhaust cells of Safeguard Building and Nuclear Auxiliary Building, Fuel Building (upstream KLE Filtration)	See Table 11.5-1, Monitors R-11, R-12, and R-13 (NABVS Cells 1-3), R-25 (SBVS Cell 6), R-17 and R-18 (FBVS Cells 4 and 5)~~, and R-19 (Fuel Handling Area Ventilation (Cell 5))~~	5E-4 – 3E+0 µCi 3E-10 – 5E-8 µCi/cc (I-131) Must be capable of detecting 10 DAC-hours
	1 aerosol monitor in laboratory exhaust air (KLE Laboratory Exhaust)	---	5E-4 – 3E+0 µCi 3E-10 – 1E-6 µCi/cc Must be capable of detecting 10 DAC-hours
	1 aerosol monitors in exhaust air of hot workshop (KLE Cell 3)	---	5E-4 – 3E+0 µCi 3E-10 – 1E-6 µCi/cc Must be capable of detecting 10 DAC-hours

2.0 PREREQUISITES

2.1 Construction activities on the radiation monitoring system have been completed with all radiation monitors positioned per Table 12.3-3, Table 12.3-4, and Table 11.5-1.

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

2.3 Support systems required for operation of the radiation monitoring system are completed and functional.

2.4 Test instrumentation is available and calibrated.

2.5 Calibration check source is available, as required.

2.6 Verify that factory acceptance testing has been completed.

2.7 Verify proper operation of alarm setpoints, operation, control, and indication functions.

2.8 Verify that upon loss and restoration of electrical power to each area radiation monitor division, as described in Table 12.3-3 and Table 12.3-4, that the area radiation monitoring system outputs attain a predefined state.

3.0 TEST METHOD

3.1 Verify the operation of the radiation monitor (refer to Tables 11.5-1,12.3-3 and 12.3-4) using a check source and external test equipment, as applicable.

3.2 Check the self-testing feature of the radiation monitor, as applicable.

3.3 Compare local and remote indications.

3.4 Verify as-designed local and remote alarm actuations, as applicable.

3.5 Initiate a high radiation signal to the MCR air intake (refer to Table 11.5-1, Monitors R-29 and R-30), main steam line (refer to Table 11.5-1, Monitors R-55 through R-58), and containment high range radiation monitors (refer to Table 12.3-3) to verify that control actuations meet design requirements. The source of initiation of the signal, listed in order of preference, should be one of the following:

3.5.1 Internal check source (verify that check source strength is capable of generating desired control actuations).

3.5.2 Radiation calibration check source (verify that check source does not generate a personnel hazard during the test).

3.5.3 Simulated high radiation signal at the radiation detector.

3.6 Verify that the radiation monitoring system operates over the design range using actual or simulated signals.

3.7 Verify that the radiation monitoring system responds as designed to actual or simulated limiting malfunctions or failures.