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## REVISED RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

### APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.: 343-8420  
SRP Section: 12.02 – Radiation Sources  
Application Section: 12.2  
Date of RAI Issue: 12/22/2015

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### **Question No. 12.02-24**

#### Requirement

10 CFR 52.47(a)(5) requires that the FSAR contain the kinds and quantities of radioactive materials expected to be produced in the operation and the means for controlling and limiting radioactive effluents and radiation exposures within the limits set forth in 10 CFR 20.

#### Issues

As a result of staff's review of the applicant's responses to draft audit questions from an August 2015 audit (ML15303A400, dated October 30, 2015), staff has the following questions:

1. SRP section 12.2 specifies that "the staff will review the description of airborne radioactive material sources in the plant considered in the design of the ventilation systems and used for the design of personnel protective measures and for dose assessment."

Regarding question 3 of the "Additional Follow up Questions from the August 12, 2015 teleconference" section of the document referenced above (on page 6), the staff requested that the applicant clarify in the FSAR that the ventilation flow rate values are minimum flow rates for the actual design of the ventilation system, instead of just flow rates assumed for calculation purposes. Initially, the applicant indicated that the values were assumed values, however, in the final response, the applicant updated the FSAR to remove the word "assumptions" in the FSAR. The final response to the question states that the minimum HVAC flow rates provided are the flow rates to maintain the DAC fractions less than 1.0 DAC, but does not specify if the HVAC system design will meet the flow rates specified. Therefore, it is still not clear if the plant ventilation system will actually be designed to meet the flow rates provided in FSAR Table 12.2-26. Please specify if the ventilation flow rates provided in FSAR Table 12.2- 26 represent actual minimum flow rate requirements for the design of the ventilation system.

2. SRP 12.2 indicates that source descriptions should include the methods, models, and assumptions used as the bases for all values provided in SAR Section 12.2. The calculations for determining Auxiliary Building ventilation filter activity were not included as part of the source term audit.

In the response to question 4 of the “Additional Follow up Questions from the August 12, 2015 teleconference” section of the document referenced above (on page 6), the applicant indicates that the Auxiliary Building ventilation filter source term was calculated based on values from the PWR-GALE code which were then back calculated based on the Auxiliary Building flow rate and then adjusted to take into account the shielding design basis source term of 0.25% fuel defect. Since the PWR-GALE code is based on data from nuclear power plant operation with minimal fuel damage and also uses different assumptions than those used in the 0.25% source term calculations of airborne radioactive material, it is unclear to staff how the values of releases from the PWR-GALE code would be converted to the 0.25% fuel defect source term in the ventilation system. Please provide a detailed description and/ or calculations demonstrating the methodology used to convert GALE code results to Auxiliary Building ventilation system values based on 0.25% fuel defect.

### **Response – (Rev.2)**

1. KHNP confirms that the room ventilation flows for HVAC design are higher than the HVAC flows in Table 12.2-26; and that the individual room HVAC flows in Table 12.2-26 are based on the minimum flow determined for individual room DAC fractions to be less than 1.0. Examples of the HVAC flow development are summarized in Table 1 to illustrate the basis for the HVAC ventilation flow design evolution.

Individual room HVAC flow is calculated for the corresponding room DAC. For example, CS pump and miniflow HX Room (Rooms 050-A01C and D) air flow is determined to be 32 SCFM for a corresponding DAC fraction of 0.1 [Calculation #1-035-N377-013, Revision 02]. In assigning the HVAC flow to Table 12.2-26, the air flow is rounded upward to 100 SCFM (converted to 170 m<sup>3</sup>/hour). In the AB controlled area HVAC design, the actual flow for this cubicle is 1050 SCFM. HVAC design ventilation flows for other rooms follow the same approach.

A note is added to Table 12.2-26 to denote that the HVAC flows listed in this table are based on the minimum flow rates required for the ventilation for the corresponding rooms for DAC fraction less than 1.0.

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**Impact on DCD**

DCD Tier 2 Section 12.2, Table 12.2-26 will be updated as indicated in the Attachment 1.

DCD Tier 2 Section 12.3, Table 12.3-4 will be revised as indicated in the Attachment 2.

DCD Tier 2 Section 12.3, Figure 12.3-9 and 12.3-15 will be revised as indicated in the Attachment 3.

**Impact on PRA**

There is no impact on the PRA.

**Impact on Technical Specifications**

There is no impact on the Technical Specifications.

**Impact on Technical/Topical/Environmental Reports**

There is no impact on any Technical, Topical or Environmental Reports.

Table 12.2-26 (8 of 8)

Cubicle	Volume (m <sup>3</sup> )	Leak Sources and Number of Sources <sup>1</sup>	Leak Rate (m <sup>3</sup> /min)	Source Terms <sup>(1), (2)</sup>	HVAC Flow (m <sup>3</sup> /hr)
Valve Rm (085-P15)	263	Valve 3" (2)	<del>5.00E-07</del>	1 PCA	510
		Valve 6" (4)	<del>4.01E-06</del>	(Except for NG)	
Valve Rm (085-P16)	269	Valve 4" (1)	<del>6.66E-07</del>	0.32 PCA	1,444
		Valve 6" (2)	<del>2.00E-06</del>	0.32 PCA	
		Valve 6" (3)	<del>3.00E-06</del>	0.1 PCA	
		Valve 6" (1)	<del>9.99E-07</del>	0.44 PCA	
		Valve 4" (2)	<del>1.33E-06</del>	0.01 PCA	

Minimum Required Ventilation Flow

5.00E-04

5.00E-03

6.66E-04

2.00E-03

3.00E-03

9.99E-04

1.33E-03

(1) PCA: Fraction of primary coolant activity concentrations

(2) NG: Noble gases

(3) The HVAC flows listed in this table represent the actual minimum flow rates required for the ventilation for the corresponding rooms

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Table 12.3-4 (4 of 7)

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Room Number	Room Name	Minimum Required Shield Thickness (inches)					
		North	South	East	West	Floor	Ceiling
<u>Auxiliary Building (cont.)</u>							
078-A37A	Deborating IX Room	15	12	10	24	24	24
078-A38A	SFP Cleanup Pump Room	23	23	23	10	23	32
078-A39A	Gas Stripper Effluent Radiation Monitor Room	23	23	23	10	16	35
078-A40B	Boric Acid Concentrator Room	16	23	23	14	16	16
086-A01A	Filter Area	-	-	18	21	13	10
100-A32B	SFP Cooling HX Room	10	10	10	10	10	10
100-A29B	Pipe and HVAC Chase	10	12	10	66	10	10
100-A13A	Mechanical Penetration Room	48	48	48	48	34	13
100-A13B	Mechanical Penetration Room	48	10	48	48	36	10
100-A16D	Pipe Chase	48	48	48	48	10	23
100-A16C	Pipe Chase	48	48	48	48	13	10
100-A24A	SFP Cooling HX Room	12	10	12	40	24	10
100-A26A	Valve Room	28	41	21	28	32	10
100-A25A	Volume Control Tank Room	42	42	42	47	48	53
111-A01B	Cask Loading Pit	48	14	48	48	42	-
114-A01B	Spent Fuel Pool	62	60	59	68	71	-
119-A01B	Refueling Canal	60	59	62	48	62	-
120-A16B	Mechanical Penetration Room	29	27	33	48	18	29
120-A16A	Mechanical Penetration Room	20	24	20	48	17	19
120-A23A	Valve Room	18	25	18	18	10	18
120-A14A	SG Blowdown Regen. HX Room	12	10	10	21	14	21
137-A19A	SG Blowdown Flash Tank Room	18	18	18	21	18	18
156-A14A	Aux. Bldg Controlled Area (I) Normal Exhaust ACU Room	18	18	18	18	18	18
174-A15B	Containment High- and Low-volume Purge ACU Room	21	21	21	21	15	10
195-A08B	Aux. Bldg. Controlled Area (II) Normal Exhaust ACU Room	18	18	18	18	18	18

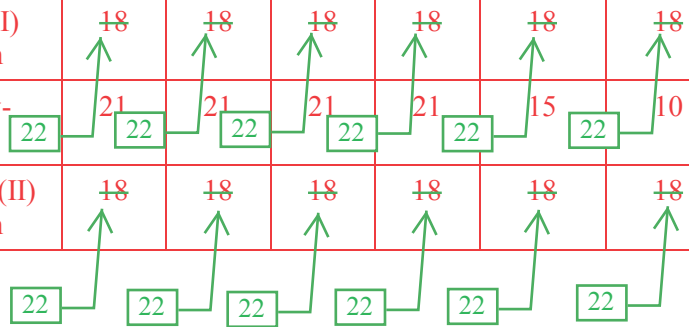




Table 12.3-4 (7 of 7)

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Room Number	Room Name	Minimum Required Shield Thickness (inches)					
		North	South	East	West	Floor	Ceiling
<u>Compound Building (cont.)</u>							
085-P32	Primary Sampling Sink Room	10	13	12	12	14	18
085-P42	IX Module Room	10	30	30	27	14	28
085-P43	IX Module Room	30	10	30	30	14	28
085-P44	RO Feed Tank Room	10	27	32	22	19	25
085-P45	Drum Removal Chase	15	15	15	15	-	25
085-P46	MF Membrane Module Room	23	10	20	15	18	16
085-P47	MF Membrane Module Room	23	16	10	12	15	16
085-P48	RO Membrane Module and Valve Skid Room	43	24	43	34	32	36
096-P01	Charcoal Delay Bed Room	22	19	21	14	28	17
096-P02	Charcoal Delay Bed Room	47	44	14	38	36	42
100-P02	GRS Equipment Removal Area	13	11	38	10	23	10
100-P07	Future Extension Area	24	30	36	37	24	31
100-P08	Truck Bay	24	24	36	37	36	31
100-P09	Waste Drum Storage Area	28	24	36	26	34	31
100-P10	Spent Filter Drum Storage Area	36	28	48	37	36	43
120-P01	Gaseous Radwaste Sample Control Panel Room	10	10	10	11	17	25
120-P02	Gaseous Radwaste Sample Valve Rack Room	20	10	25	17	17	25
139-P06	Normal Exhaust ACU Room	20	20	20	20	20	20

Security-Related Information – Withhold Under 10 CFR 2.390

Security-Related Information - Withheld Under 10 CFR 2.390

**Figure 12.3-9 Radiation Zones (Normal) Auxiliary/Reactor Containment Building El. 195'-0" and Roof Plan**

Non-Security-Related  
Information  
Non-Proprietary

Security-Related Information - Withheld Under 10 CFR 2.390

Security-Related Information – Withhold Under 10 CFR 2.390

Security-Related Information - Withheld Under 10 CFR 2.390

Figure 12.3-15 Radiation Zones (Normal) Compound Building El. 139'-6"

Non-Security-Related  
Information  
Non-Proprietary

Security-Related Information - Withheld Under 10 CFR 2.390