
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.: 141-8098
SRP Section: 12.03-12.04 - Radiation Protection Design Features
Application Section: 12.3
Date of RAI Issue: 08/07/2015

Question No. 12.03-8

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.

INFORMATION NEEDED

SRP 12.3-12.4 indicates that the shielding should be specified for each of the radiation sources identified in Chapter 11 and Section 12.2, and other applicable sections. Staff has identified the following shielding information that is missing or incorrect.

1. While FSAR Table 12.3-4 identifies design basis radiation shield thicknesses for plant rooms for which shielding is necessary, there are several rooms containing significant sources, or significant dose rates (some of them potentially greater than 100 Rad/hour), for which no shielding thicknesses are provided. Please provide the minimum required shield thicknesses for the following rooms in FSAR Table 12.3-4 or justify why they are not needed (if an area is inaccessible then minimum shielding thicknesses are not needed):
 - a. Room 089-C01 (Core Debris Chamber, Figure 12.3-3)
 - b. Room 086-A01A (Filter Area, Figure 12.3-3)
 - c. Room 063-P38 (Solidification and Drum Conveyor Room, Figure 12.3-10)
 - d. Room 085-P32 (Primary Sampling Sink Room, Figure 12.3-12)
 - e. Room 085-P45 (Drum Removal Chase, Figures 12.3-11 through 12.3-12)

- f. Room 100-P02 (GRS Equipment Removal Area, Figure 12.3-13)
 - g. Room 100-P10 (Spent Filter Drum Storage Area, Figure 12.3-13)
 - h. Room 120-P01 (Gaseous Radwaste Sample Control Panel Room, Figure 12.3-14)
 - i. Room 120-P02 (Gaseous Radwaste Sample Valve Rack Room, Figure 12.3-14)
2. In FSAR Table 12.3-4 Room 063-005 is labeled "Future Use" and Room 063-P06 is labeled "Spent Resin Long-term Storage Tank Room" however, in FSAR Figure 12.3-12 Room 063-005 is labeled "Spent Resin Long-Term Storage Tank Room" and Room 063-P06 is labeled "Future Use." Please correct this discrepancy.
 3. While the FSAR indicates that there are four gaseous radwaste system delay beds, it is unclear which rooms each delay bed is located. FSAR Table 12.3-4 indicates that Rooms 096-P01 and 096-P02 are delay bed rooms. Please specify in the FSAR which rooms each of the delay beds (1, 2, 3, and 4) are located.

Response

1. The minimum required shield thicknesses for the above rooms except for Core Debris Chamber and Filter Area is provided in DCD Table 12.3-4.

Core Debris Chamber (089-C01) is designed to minimize the direct containment heating as a severe accident mitigation feature and personnel access to this area is not allowed during normal operation. Since this area is surrounded by massive concrete structure with more than 6 ft, it is not necessary to provide additional shielding requirement.

The Filter Area (086-A01A) shown in Figure 12.3-3 is an open space above the filter cubicles used for replacement of the spent filters. Therefore, shielding for this area is not required. The arrow marker for the Filter Area in Figure 12.3-3 looks like it is indicating the Filter Cartridge Storage Room (077-A15A), which is shown in Figure 12.3-2. Minimum shield thicknesses for the Filter Cartridge Storage Room are provided in Table 12.3-4.

In addition, the minimum shield thicknesses for other missing rooms such as Chemical Drain Sump Pump room (055-A31B), Condensate Return Unit room (055-A46A), Valve room (055-A59A), and Refueling Canal (119-A01B) will also be added in DCD Table 12.3-4.

Table 12.3-4 was originally prepared to provide the minimum shield thicknesses required to maintain the radiation zone during normal operation. However, since the eventual shield thicknesses are determined to provide accessibility to vital areas during post-accident conditions, Table 12.3-4 is updated to provide the thicknesses which meet both normal operation and accident conditions. In addition, Table 12.3-4 is updated to correct some discrepancies between the table and the supporting shielding calculations.

2. As shown in DCD Figure 12.3-12, Room 063-P05 is the Spent Resin Long-term Storage Tank Room, and Room 063-P06 is a room for "Future Use". Therefore, Table 12.3-4 will be updated to correct this discrepancy.
 3. Two delay beds are located in a cubicle. The first and second delay beds are located in Room 096-P02, and the third and fourth beds are in Room 096-P01.
-

Impact on DCD

DCD Table 12.3-4 will be revised as indicated in the Attachment.

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.

APR1400 DCD TIER 2

Table 12.3-4 (1 of 7)

This table should be revised based on "A" after this table

Design Basis Radiation Shield Thicknesses

Room Number	Room Name	Minimum Required Shield Thickness (inches)					
		North	South	East	West	Floor	Ceiling
<u>Containment Building</u>							
069-C01	ICI Cavity	-	60	79	60	-	-
078-C01	Reactor Cavity	80	80	79	79	-	-
080-C01	Holdup Volume Tank	36	36	-	79	-	-
100-C03	Reactor Drain Tank	24	24	48	24	-	-
100-C04	Letdown HX Room	24	24	48	24	-	-
128-C01	Regenerative HX Room	60	60	48	48	-	-
<u>Auxiliary Building</u>							
050-A01C	CS Pump & Miniflow HX Room	10	20	10	20	Ground	27
050-A01D	CS Pump & Miniflow HX Room	20	10	10	20	Ground	27
050-A02C	SI Pump Room	10	17	10	10	Ground	25
050-A02D	SI Pump Room	17	10	10	10	Ground	25
050-A03A	SI Pump Room	25	17	10	10	Ground	25
050-A03B	SI Pump Room	17	10	10	10	Ground	25
050-A04A	SC Pump and Miniflow HX Room	10	20	22	24	Ground	27
050-A04B	SC Pump and Miniflow HX Room	20	21	22	24	Ground	27
055-A01C	CS HX Room	10	10	10	10	Ground	10
055-A01D	CS HX Room	10	10	10	10	Ground	10
055-A08C	Floor Drain Sump Pump Room	17	10	14	10	Ground	14
055-A08D	Floor Drain Sump Pump Room	10	10	14	10	Ground	14
055-A14C	Pipe Chase and Valve Room	13	10	20	13	Ground	16
055-A14D	Pipe Chase and Valve Room	10	21	10	21	Ground	21
055-A18A	Pipe Chase and Valve Room	29	10	29	20	Ground	16
055-A18B	Pipe chase and Valve Room	15	21	10	10	Ground	21
055-A21A	Pipe Chase and Valve Room	10	23	25	32	Ground	32

APRI400 DCD TIER 2

This table should be revised based on "A" after this table

Table 12.3-4 (2 of 7)

Room Number	Room Name	Minimum Required Shield Thickness (inches)					
		North	South	East	West	Floor	Ceiling
<u>Auxiliary Building (cont.)</u>							
055-A21B	Pipe Chase and Valve Room	25	10	20	10	Ground	32
055-A22A	Pipe Chase	10	10	33	21	Ground	10
055-A22B	Pipe Chase	10	10	24	21	Ground	13
055-A30A	SC HX Room	22	35	35	22	Ground	25
055-A30B	SC HX Room	35	27	35	22	Ground	28
055-A33A	Equipment Drain Sump Pump Room	10	22	14	10	Ground	14
055-A33B	Equipment Drain Sump Pump Room	19	10	10	10	Ground	15
055-A34A	Floor Drain Sump Pump Room	10	22	10	22	Ground	11
055-A34B	Floor Drain Sump Pump Room	22	10	10	22	Ground	34
055-A38A	Boronometer Room	25	25	16	25	Ground	28
055-A39A	Process Radiation Monitor Room	19	19	11	19	Ground	21
055-A42A	Charging Pump Room	17	24	24	28	Ground	22
055-A43A	Charging Pump Miniflow HX Room	10	18	10	15	Ground	19
055-A45A	Pipe Chase	27	17	25	10	Ground	24
055-A47B	Primary Off-Gas Sample Pump Room	16	14	16	15	Ground	14
055-A51B	Equipment Drain Tank Room	12	28	37	26	Ground	24
055-A52B	Reactor Drain Pump Room	13	12	10	13	Ground	10
055-A53B	Reactor Drain Pump Room	13	12	23	10	Ground	10
055-A54B	Aux. Charging Pump Room	10	14	14	12	Ground	13
055-A55B	Charging Pump Room	14	14	14	39	Ground	17
055-A56A	Valve Room	12	10	28	18	Ground	19
055-A56B	Valve Room	14	20	12	10	Ground	10
055-A58A	Pipe Chase	18	10	26	26	Ground	20
068-A06A	Gas Stripper Room	37	35	45	35	30	24
068-A07A	Hot Pipe Way	13	29	31	29	24	24

APR1400 DCD TIER 2

This table should be revised based on "A" after this table

Table 12.3-4 (3 of 7)

Room Number	Room Name	Minimum Required Shield Thickness (inches)					
		North	South	East	West	Floor	Ceiling
<u>Auxiliary Building (cont.)</u>							
068-A08B	Hot Pipe Way	33	24	24	22	23	30
068-A09B	Valve Room	36	17	23	36	10	14
068-A10A	Filter and Demin. Valve Area	10	10	33	33	30	19
068-A11A	Filter and Demin. Valve Area	15	36	15	27	21	21
068-A12A	Filter and Demin. Valve Area	10	18	10	18	17	29
077-A01A	Reactor Drain Filter Pit	35	10	10	14	24	23
077-A02A	SFP Cleanup Filter Pit	10	10	10	10	23	23
077-A03A	SFP Demin Filter Pit	10	17	10	24	23	23
077-A04A	SFP Cleanup Filter Pit	10	10	10	10	23	23
077-A05A	SFP Demin. Filter Pit	10	10	10	10	23	23
077-A06A	Purification Filter Pit	10	10	10	10	10	39
077-A07A	Reactor Makeup Water Filter Pit	18	32	24	18	10	10
077-A08A	Purification Filter Pit	10	10	10	10	10	39
077-A09A	SGBD Filter Pit	10	10	10	10	22	23
077-A10A	Seal Injection Filter Pit	10	10	10	11	24	24
077-A11A	SGBD Filter Pit	10	10	10	10	22	23
077-A12A	Seal Injection Filter Pit	10	13	10	10	14	24
077-A13A	SGBD Filter Pit	35	10	10	10	22	23
077-A14A	Boric Acid Filter Pit	13	18	10	29	10	13
077-A15A	Filter Cartridge Storage	32	39	39	39	18	39
078-A21A	Pipe Chase	10	35	48	21	10	22
078-A21B	Pipe Chase	36	10	24	21	10	10
078-A32A	SPF Cleanup Demin. Room	10	23	23	21	10	24
078-A33A	SG Blowdown Demin. Room	33	10	25	10	10	23
078-A34A	Pre-Holdup IX Room	33	15	15	33	24	15
078-A35A	Purification IX Room	12	24	29	43	29	42
078-A36A	Boric Acid IX Room	24	18	18	18	18	18

APR1400 DCD TIER 2

This table should be revised based on "A" after this table

Table 12.3-4 (4 of 7)

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	26	24	24
078-A38A	SFP Cleanup Pump Room	18	16	23	10	32	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
100-A32B	SFP Cooling HX Room	10	10	10	10	10	10
100-A29B	Pipe and HVAC Chase	10	10	10	10	10	10
100-A13A	Mechanical Penetration Room	25	22	22	30	34	14
100-A13B	Mechanical Penetration Room	35	10	23	21	36	10
100-A16D	Pipe Chase	23	21	23	23	10	13
100-A16C	Pipe Chase	21	10	10	10	10	10
100-A24A	SFP Cooling HX Room	12	10	12	32	24	10
100-A26A	Valve Room	28	20	20	28	32	10
100-A25A	Volume Control Tank Room	42	47	42	47	48	53
111-A01B	Cask Loading Pit	48	14	48	48	42	-
114-A01B	Spent Fuel Pool	62	60	59	71	73	-
120-A16B	Mechanical Penetration Room	29	27	10	21	18	29
120-A16A	Mechanical Penetration Room	23	12	23	21	17	19
120-A23A	Valve Room	18	11	18	18	18	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

APR1400 DCD TIER 2

This table should be revised based on "A" after this table

Table 12.3-4 (5 of 7)

Room Number	Room Name	Minimum Required Shield Thickness (inches)					
		North	South	East	West	Floor	Ceiling
<u>Compound Building</u>							
063-P01	Hot Pipe Chase	10	28	28	10	Ground	10
063-P02	GRS Header Drain Tank Room	35	40	48	36	Ground	18
063-P03	Valve Room	30	10	37	27	Ground	10
063-P04	GRS Inlet Skid Room	21	32	10	21	Ground	10
063-P05	Future Use	27	35	48	36	Ground	46
063-P06	Spent Resin Long-term Storage Tank Room	36	27	48	36	Ground	39
063-P07	Valve Room	16	29	36	30	Ground	10
063-P08	Low-activity Spent Resin Tank Room	27	32	35	10	Ground	10
063-P09	Valve Room	16	36	10	16	Ground	18
063-P13	Hot Pipe Chase	40	33	40	33	Ground	22
063-P14	Hot Tool Room	15	10	10	10	Ground	32
063-P21	Equip. Waste Pump Room	17	19	10	20	Ground	17
063-P22	Equip. Waste Pump Room	10	17	10	21	Ground	18
063-P23	Equip. Waste Tank Room	13	33	20	22	Ground	27
063-P24	Equip. Waste Tank Room	16	13	21	22	Ground	27
063-P25	Floor Drain Pump Room	14	10	11	19	Ground	10
063-P26	Normal Sump Pump Room	14	14	11	14	Ground	16
063-P27	Chemical Waste Pump Room	10	14	10	13	Ground	16
063-P28	Floor Drain Tank Room	16	16	19	20	Ground	29
063-P29	Floor Drain Tank Room	16	16	19	20	Ground	29
063-P30	Chemical Waste Tank Room	10	16	14	10	Ground	15
063-P31	Chemical Waste Tank Room	10	10	13	10	Ground	15
063-P36	Chemical Drain Sump Pump Room	10	10	10	10	Ground	14

APRI400 DCD TIER 2

This table should be revised based on "A" after this table

Table 12.3-4 (6 of 7)

Room Number	Room Name	Minimum Required Shield Thickness (inches)					
		North	South	East	West	Floor	Ceiling
<u>Compound Building (cont.)</u>							
063-P37	Monitor Tank Room	10	10	10	10	Ground	10
063-P39	Spent Resin Long-term Storage Tank Sump Pump Room	18	20	18	21	Ground	18
063-P40	Concentrate Pump Room	27	24	20	16	Ground	19
063-P41	Concentrate Holding Tank Room	21	27	37	28	Ground	10
063-P42	RO Feed Pump Room	10	10	28	16	Ground	28
063-P43	IX Feed Pump Room	16	10	16	10	Ground	35
063-P44	IX Feed Tank Room	14	16	11	14	Ground	23
063-P47	CTS HEPA Vacuum Skid Room	24	10	21	10	Ground	10
063-P48	CTS Dryer Skid Room	31	24	14	21	Ground	15
063-P49	CTS Vacuum Skid Room	18	18	21	18	Ground	14
063-P54	Monitor Tank Pump Room	10	10	10	10	Ground	14
063-P73	Instrument Calibrator Facility	36	48	18	48	Ground	36
077-P01	Hot Pipe Way	18	35	41	34	35	30
085-P01	Waste Gas Dryer Skid Room	17	25	25	19	17	22
085-P02	Waste Gas Dryer Skid Room	11	17	17	19	17	22
085-P03	Valve Room	48	11	30	34	18	35
085-P04	Charcoal Guard Bed Room	10	23	34	18	10	27
085-P06	Valve Room	19	34	36	30	10	27
085-P07	Valve Room	22	24	31	28	10	24
085-P08	Valve Room	24	19	22	24	19	24
085-P15	Valve Room	10	23	23	18	10	23
085-P16	Valve Room	10	22	21	19	10	22
085-P17	Valve Room	10	13	10	10	10	20
085-P20	Valve Room	12	19	19	19	10	16
085-P21	Charcoal Guard Bed Room	10	10	10	13	10	27
085-P31	Primary Sampling Room	10	10	10	10	10	10

APR1400 DCD TIER 2

This table should be revised based on "A" after this table

Table 12.3-4 (7 of 7)

Room Number	Room Name	Minimum Required Shield Thickness (inches)					
		North	South	East	West	Floor	Ceiling
<u>Compound Building (cont.)</u>							
085-P42	IX Module Room	10	30	24	27	10	28
085-P43	IX Module Room	30	10	24	30	10	28
085-P44	RO Feed Tank Room	10	22	32	22	19	25
085-P46	MF Membrane Module Room	23	10	25	17	18	16
085-P47	MF Membrane Module Room	23	16	10	12	15	21
085-P48	RO Membrane Module and Valve Skid Room	48	23	48	34	32	36
096-P01	Charcoal Delay Bed Room	22	19	21	14	28	17
096-P02	Charcoal Delay Bed Room	47	44	14	41	35	42
100-P08	Truck Bay	26	15	36	37	36	31
100-P09	Waste Drum Storage Area	20	26	27	13	21	31

Table 12.3-4 (1 of 7)

“A”

Design Basis Radiation Shield Thicknesses

Room Number	Room Name	Minimum Required Shield Thickness (inches)					
		North	South	East	West	Floor	Ceiling
<u>Containment Building</u>							
069-C01	ICI Cavity	-	60	79	60	Ground	-
078-C01	Reactor Cavity	80	80	79	79	Ground	-
080-C01	Holdup Volume Tank	36	36	-	79	Ground	-
100-C02	Steam Generator Cavity	36	36	30	36	Ground	-
100-C03	Reactor Drain Tank	24	24	48	24	-	24
100-C04	Letdown HX Room	24	24	48	24	-	24
128-C01	Regenerative HX Room	60	60	48	48	24	48
136-C02	Pressurizer Cavity	33	36	30	33	30	-
<u>Auxiliary Building</u>							
050-A01C	CS Pump & Miniflow HX Room	48	48	10	20	Ground	30
050-A01D	CS Pump & Miniflow HX Room	48	48	10	20	Ground	30
050-A02C	SI Pump Room	48	48	10	10	Ground	30
050-A02D	SI Pump Room	48	48	10	10	Ground	30
050-A03A	SI Pump Room	48	48	10	10	Ground	30
050-A03B	SI Pump Room	48	48	10	10	Ground	30
050-A04A	SC Pump and Miniflow HX Room	48	48	27	10	Ground	30
050-A04B	SC Pump and Miniflow HX Room	48	48	27	10	Ground	30
055-A01C	CS HX Room	10	10	10	10	Ground	10
055-A01D	CS HX Room	10	10	10	10	Ground	10
055-A08C	Floor Drain Sump Pump Room	14	10	14	10	Ground	14
055-A08D	Floor Drain Sump Pump Room	10	14	14	10	Ground	14
055-A14C	Pipe Chase and Valve Room	13	48	20	13	Ground	30
055-A14D	Pipe Chase and Valve Room	48	18	10	48	Ground	30
055-A18A	Pipe Chase and Valve Room	42	48	48	20	Ground	30
055-A18B	Pipe chase and Valve Room	48	42	48	10	Ground	30
055-A21A	Pipe Chase and Valve Room	10	48	25	29	Ground	32

“A”

Table 12.3-4 (2 of 7)

Room Number	Room Name	Minimum Required Shield Thickness (inches)					
		North	South	East	West	Floor	Ceiling
<u>Auxiliary Building (cont.)</u>							
055-A21B	Pipe Chase and Valve Room	48	10	20	10	Ground	32
055-A22A	Pipe Chase	10	10	33	42	Ground	10
055-A22B	Pipe Chase	10	10	27	42	Ground	10
055-A30A	SC HX Room	22	30	30	22	Ground	25
055-A30B	SC HX Room	30	30	30	22	Ground	28
055-A31B	Chemical Drain Sump Pump Room	27	10	10	10	Ground	20
055-A33A	Equipment Drain Sump Pump Room	10	22	14	10	Ground	14
055-A33B	Equipment Drain Sump Pump Room	19	10	10	10	Ground	17
055-A34A	Floor Drain Sump Pump Room	10	22	10	22	Ground	11
055-A34B	Floor Drain Sump Pump Room	22	10	10	22	Ground	18
055-A38A	Boronometer Room	25	25	34	25	Ground	28
055-A39A	Process Radiation Monitor Room	19	19	11	19	Ground	21
055-A42A	Charging Pump Room	17	24	24	28	Ground	22
055-A43A	Charging Pump Miniflow HX Room	10	18	10	10	Ground	19
055-A45A	Pipe Chase	27	17	25	10	Ground	24
055-A46A	Condensate Return Unit Room	28	37	10	16	Ground	16
055-A47B	Primary Off-Gas Sample Pump Room	16	10	16	15	Ground	10
055-A51B	Equipment Drain Tank Room	12	28	37	26	Ground	24
055-A52B	Reactor Drain Pump Room	13	12	10	13	Ground	17
055-A53B	Reactor Drain Pump Room	13	12	23	10	Ground	17
055-A54B	Aux. Charging Pump Room	10	14	14	12	Ground	13
055-A55B	Charging Pump Room	14	14	14	20	Ground	17
055-A56A	Valve Room	10	18	28	10	Ground	19
055-A56B	Valve Room	14	20	12	10	Ground	10
055-A58A	Pipe Chase	18	10	26	26	Ground	10
055-A59A	Valve Room	19	10	26	34	Ground	24

Table 12.3-4 (3 of 7)

“A”

Room Number	Room Name	Minimum Required Shield Thickness (inches)					
		North	South	East	West	Floor	Ceiling
<u>Auxiliary Building (cont.)</u>							
068-A06A	Gas Stripper Room	37	35	45	35	30	24
068-A07A	Hot Pipe Way	13	29	31	29	24	24
068-A08B	Hot Pipe Way	33	24	24	20	23	30
068-A09B	Valve Room	19	17	23	19	17	10
068-A10A	Filter and Demin. Valve Area	10	10	33	33	30	24
068-A11A	Filter and Demin. Valve Area	10	24	10	22	24	21
068-A12A	Filter and Demin. Valve Area	10	18	10	18	17	29
077-A01A	Reactor Drain Filter Pit	35	10	10	15	10	23
077-A02A	SFP Cleanup Filter Pit	10	10	10	10	23	23
077-A03A	SFP Demin Filter Pit	10	17	10	24	23	23
077-A04A	SFP Cleanup Filter Pit	10	10	10	10	23	23
077-A05A	SFP Demin. Filter Pit	10	10	10	10	23	23
077-A06A	Purification Filter Pit	10	10	10	10	10	39
077-A07A	Reactor Makeup Water Filter Pit	18	32	24	18	10	10
077-A08A	Purification Filter Pit	10	10	10	10	10	39
077-A09A	SGBD Filter Pit	10	10	10	10	22	23
077-A10A	Seal Injection Filter Pit	10	10	10	11	24	24
077-A11A	SGBD Filter Pit	10	10	10	10	22	23
077-A12A	Seal Injection Filter Pit	10	13	10	10	13	24
077-A13A	SGBD Filter Pit	35	10	10	10	22	23
077-A14A	Boric Acid Filter Pit	13	18	10	29	10	13
077-A15A	Filter Cartridge Storage	32	39	39	39	25	39
078-A21A	Pipe Chase	10	36	48	48	10	24
078-A21B	Pipe Chase	36	10	48	48	10	10
078-A32A	SPF Cleanup Demin. Room	10	22	22	21	12	24
078-A33A	SG Blowdown Demin. Room	33	10	23	10	10	23
078-A34A	Pre-Holdup IX Room	33	15	15	33	15	24
078-A35A	Purification IX Room	12	24	29	43	29	42
078-A36A	Boric Acid IX Room	24	18	18	18	18	18

“A”

Table 12.3-4 (4 of 7)

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 (5 of 7)

“A”

Room Number	Room Name	Minimum Required Shield Thickness (inches)					
		North	South	East	West	Floor	Ceiling
<u>Compound Building</u>							
063-P01	Hot Pipe Chase	10	28	28	10	Ground	17
063-P02	GRS Header Drain Tank Room	35	40	48	36	Ground	18
063-P03	Valve Room	27	30	37	10	Ground	10
063-P04	GRS Inlet Skid Room	21	32	10	21	Ground	13
063-P05	Spent Resin Long-term Storage Tank Room	27	35	48	36	Ground	46
063-P06	Future Use	36	27	48	36	Ground	39
063-P07	Valve Room	16	29	36	30	Ground	14
063-P08	Low-activity Spent Resin Tank Room	27	32	35	10	Ground	10
063-P09	Valve Room	16	36	10	16	Ground	18
063-P13	Hot Pipe Chase	40	33	40	33	Ground	19
063-P14	Hot Tool Room	15	10	10	10	Ground	32
063-P21	Equip. Waste Pump Room	17	19	10	20	Ground	17
063-P22	Equip. Waste Pump Room	10	17	10	21	Ground	17
063-P23	Equip. Waste Tank Room	13	33	20	22	Ground	27
063-P24	Equip. Waste Tank Room	16	13	21	22	Ground	27
063-P25	Floor Drain Pump Room	14	10	11	19	Ground	10
063-P26	Normal Sump Pump Room	14	14	10	19	Ground	16
063-P27	Chemical Waste Pump Room	10	14	10	15	Ground	16
063-P28	Floor Drain Tank Room	16	16	19	20	Ground	29
063-P29	Floor Drain Tank Room	16	16	19	20	Ground	29
063-P30	Chemical Waste Tank Room	10	16	15	10	Ground	15
063-P31	Chemical Waste Tank Room	10	10	15	10	Ground	15
063-P36	DWS Drain Sump Pump Room	10	10	10	10	Ground	10

Table 12.3-4 (6 of 7)

“A”

Room Number	Room Name	Minimum Required Shield Thickness (inches)					
		North	South	East	West	Floor	Ceiling
<u>Compound Building (cont.)</u>							
063-P37	Monitor Tank Room	10	18	11	18	Ground	10
063-P38	PSS-Solidification & Drum Conveyer Room	17	24	24	21	Ground	14
063-P39	Spent Resin Long-term Storage Tank Sump Pump Room	18	20	18	21	Ground	18
063-P40	Concentrate Pump Room	27	24	20	16	Ground	19
063-P41	Concentrate Holding Tank Room	21	27	33	28	Ground	10
063-P42	RO Feed Pump Room	10	10	28	16	Ground	24
063-P43	IX Feed Pump Room	16	10	16	10	Ground	24
063-P44	IX Feed Tank Room	14	16	11	10	Ground	23
063-P47	CTS HEPA Vacuum Skid Room	24	10	21	10	Ground	10
063-P48	CTS Dryer Skid Room	31	24	17	21	Ground	15
063-P49	CTS Vacuum Skid Room	10	10	21	10	Ground	18
063-P54	Monitor Tank Pump Room	10	10	10	10	Ground	14
063-P73	Instrument Calibrator Facility	36	43	18	48	Ground	36
085-P01	Waste Gas Dryer Skid Room	17	25	25	19	17	22
085-P02	Waste Gas Dryer Skid Room	11	17	10	19	17	22
085-P03	Valve Room	48	11	30	26	18	36
085-P04	Charcoal Guard Bed Room	26	26	34	18	10	23
085-P06	Valve Room	19	26	36	30	19	27
085-P07	Valve Room	27	24	30	30	14	24
085-P08	Valve Room	24	19	22	24	19	24
085-P15	Valve Room	10	21	21	18	10	23
085-P16	Valve Room	10	22	18	19	10	22
085-P17	Valve Room	10	10	10	14	10	17
085-P20	Valve Room	16	16	16	16	10	16
085-P21	Charcoal Guard Bed Room	26	26	18	34	10	23
085-P31	Primary Sampling Room	10	10	10	10	10	10

Table 12.3-4 (7 of 7)

“A”

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

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.: 141-8098
SRP Section: 12.03-12.04 - Radiation Protection Design Features
Application Section: 12.3
Date of RAI Issue: 08/07/2015

Question No. 12.03-9

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.

10 CFR 20.1101(b) indicates in part that engineering controls should be used to maintain radiation exposures ALARA.

10 CFR 50, Appendix A, Criterion 61 requires in part that radioactive waste systems and other systems which may contain radioactivity contain suitable shielding for radiation protection.

GUIDANCE

SRP 12.3-12.4 indicates that the shielding should be specified for each of the radiation sources identified in Chapter 11 and Section 12.2, and other applicable sections.

SRP 12.3-12.4 also indicates that the acceptability of the facility design will be based on evidence that the applicant has fulfilled the dose limiting requirements. The SRP indicates that this includes evidence that major exposure accumulating functions (maintenance, refueling, radioactive material handling and processing, inservice inspection, calibration, decommissioning, and recovery from accidents) have been considered in plant design that the evidence should also include radiation protection features incorporated into the design, taking into account the state of technology, that will keep potential radiation exposure from these activities ALARA in accordance with 10 CFR 20.1101(b).

Finally, SRP 12.3-12.4 states that, the areas inside the plant structures, as well as in the general plant yard, should be subdivided into radiation zones, with maximum design dose rate zones and the criteria used in selecting maximum dose rates identified. Maximum zone dose rates should be defined for each zone, depending on anticipated occupancy and access control.

Regulatory Guide 8.8 provides guidance on minimizing radiation exposure to the extent practicable and on appropriate plant shielding design.

INFORMATION NEEDED

Based on a review of the Chapter 12 normal operation radiation zone figures, staff has several questions related to the figures including, the minimum shield thicknesses provided in FSAR Table 12.3-4 as well as several questions related to access routes and zoning for certain areas. The questions are as follows:

1. In FSAR Figure 12.3-1 there is a door in room 055-A18A (the tendon gallery entrance area). Please indicate if this is an entrance into containment.
2. In FSAR Figure 12.3-1 please indicate how a worker would be expected to get from room 055-A07D to room 055-A08D and from room 055-A07C to room 055-A57C (all radiological areas). It is not clear that there is access between these areas without going through emergency exits through clean (non-radiological) areas.
3. In FSAR Figure 12.3-9 most of room 195-A08B (Auxiliary Building Controlled Area (II) Normal Exhaust Accumulation Room) is labeled as between a 0.20 mSv/hour and 1 mSv/hour radiation area, except for two areas in the south east and south west corners of the room which are labeled less than 0.0025 mSv/hour. The 0.0025 mSv/hour area in the south east corner also extends into a large portion of the room to the east on that same elevation, room 156-A08B (new fuel container laydown and inspection area). The lines separating the areas are irregular and do not appear to indicate any kind of shielding or any particular distance from sources that would result in a dose drop. Please explain why the areas in the southeast and southwest corners of room 195-A08B and southern portion of room 156-A08A are labeled as less than 0.0025 mSv/hour.
4. In FSAR Figure 12.3-10, room 063-P73 (Instrument Calibrator Facility), labeled as an area where dose rates could potentially exceed 5 Sv/hour, is surrounded by rooms with dose rates labeled as less than 0.05 mSv/hour or less. In FSAR Table 12.3-4, the north, south, west, and ceiling of 063-P73 all have minimum concrete thicknesses of 36 inches or greater (the south and west walls are 48 inches), however, the east wall only has a minimum thickness of 18 inches. Please describe how the 18 inch shield thickness for the east wall was determined. Since room 063-P73 is a potentially very high radiation area, if unique assumptions for the shielding for room 063-P73 were used, please update the FSAR with this information.
5. In FSAR Figure 12.3-10, Note 1 is included in corridor (063-P46). However, the FSAR does not provide any notes for Figure 12.3-10. Please indicate what this note represents in the FSAR.
6. FSAR Figure 12.3-13 includes note 1 indicating that the truck bays (100-P08) and future extension area (100-P07) will be reclassified from zone 2 to zone 7 during transfer and drumming of spent filter and spent resin. Staff has the following questions regarding this:

- a. In order for the note to be more clearly identified, please write "Note 1" in the truck bays and future extension area.
 - b. While FSAR Table 12.3-4 provides shielding for the truck bays which appears appropriate for a zone 7 room, FSAR Table 12.3-4 provides no minimum shielding thicknesses for the future extension area. Please provide this information.
7. The purpose of the waste drum transfer room (100-P60) is unclear. It does not appear to be discussed in Chapters 11 and 12 of the FSAR. It appears on FSAR Figure 12.3-13, elevation 100 foot, and appears to be separated from the waste drum storage area (100-P09) and truck bays (100-P08) by a solid wall and it is unclear if the crane servicing the waste drum storage area and truck bays is capable of servicing the waste drum transfer room, particular because the waste drum transfer room does not extend up to elevation 120 foot, as the drum storage area and truck bays do. Please discuss the purpose of the waste drum transfer room and how drums are transferred from this room to the waste drum storage area and the truck bays.
8. FSAR Table 12.3-4 indicates that no shielding is needed east of the holdup volume tank. Please indicate why no shielding is needed in this area.
9. In reviewing FSAR Table 12.3-4, staff notes that none of the rooms in containment require shielding above or below them. Please discuss why shielding is not needed above or below these sources.
10. Please update the FSAR to discuss any shielding around the pressurizer, steam generators, and reactor coolant pumps. For example, please discuss any shielding between these components and the operating floor and the containment annulus area.
11. Please indicate in the FSAR if containment entries are allowed during operation and if so identify which areas are accessible.
12. Many of the walls in the Chapter 12 radiation zone figures include two unknown symbols. One symbol resembles an "X" with a box around it. For example, in FSAR Figure 12.3-1, on the wall between rooms 055-A07D and 055-A01D there is one of these symbols. In addition, on the wall between room 055-A07D and 050-A01D, there are two of these symbols. The other symbol has a bunch of dots, usually with three lines going through the dots. For example on Figure 12.3-1 between rooms 050-A01D and 055-A14D there is one of these symbols. It is unclear if these symbols could represent some kind of removable shield wall, door, or some other design feature pertinent to the radiological review. Please identify what these symbols represent and include their meaning on the legend for each of the figures.
13. Many of the rooms with the more significant radiation sources include continuous and dashed lines that would appear to indicate some type of shielding. For example, in Figure 12.3-1, the Room 055-A51B (Equipment Drain Tank Room), on the south side leading from the door, there are continuous and dashed lines. They appear to be denoting some type of shield wall for a labyrinth entrance way into the room, however, it is unclear why some lines are dashed and some are continuous. In addition, it is

unclear how thick these walls are or how any description in the FSAR of how thick these labyrinth walls have to be to achieve the desired appropriate radiation levels at the entrance to the room or within the labyrinth. Please update the FSAR to include this information.

Response

1. According to DCD Figure 12.3-1, the room number for Tendon Gallery Entrance Area is 055-A10C, not 055-A18A. Since the Room 055-A10C is not connected to inside of containment, there is no entrance to containment through this door.
2. There are pathways from 055-A07D to 055-A08D and from 055-A07C to 055-A57C below the mezzanine floor of 70'-0" as shown in Figure 1 and Figure 2 below.

TS



Figure 1. Pathways from 055-A07D to 055-A08D

Figure 2. Pathway from 055-A07C to 055-A57C

3. The areas in the south east and south west corners below the irregular lines in Figure 12.3-9 indicate the roof areas above Room 195-A08B (Auxiliary Building Controlled Area (II) Normal Exhaust ACU Room) and Room 156-A08B (New Fuel Container Laydown and Inspection Area) as shown in Figure 3 below. The irregular lines were used to present the roof (Elevation 213'-6") in the same Figure 12.3-9, which is based on elevation 195'-0", to be consistent with General Arrangement (GA) Drawing in Figure 1.2-19.

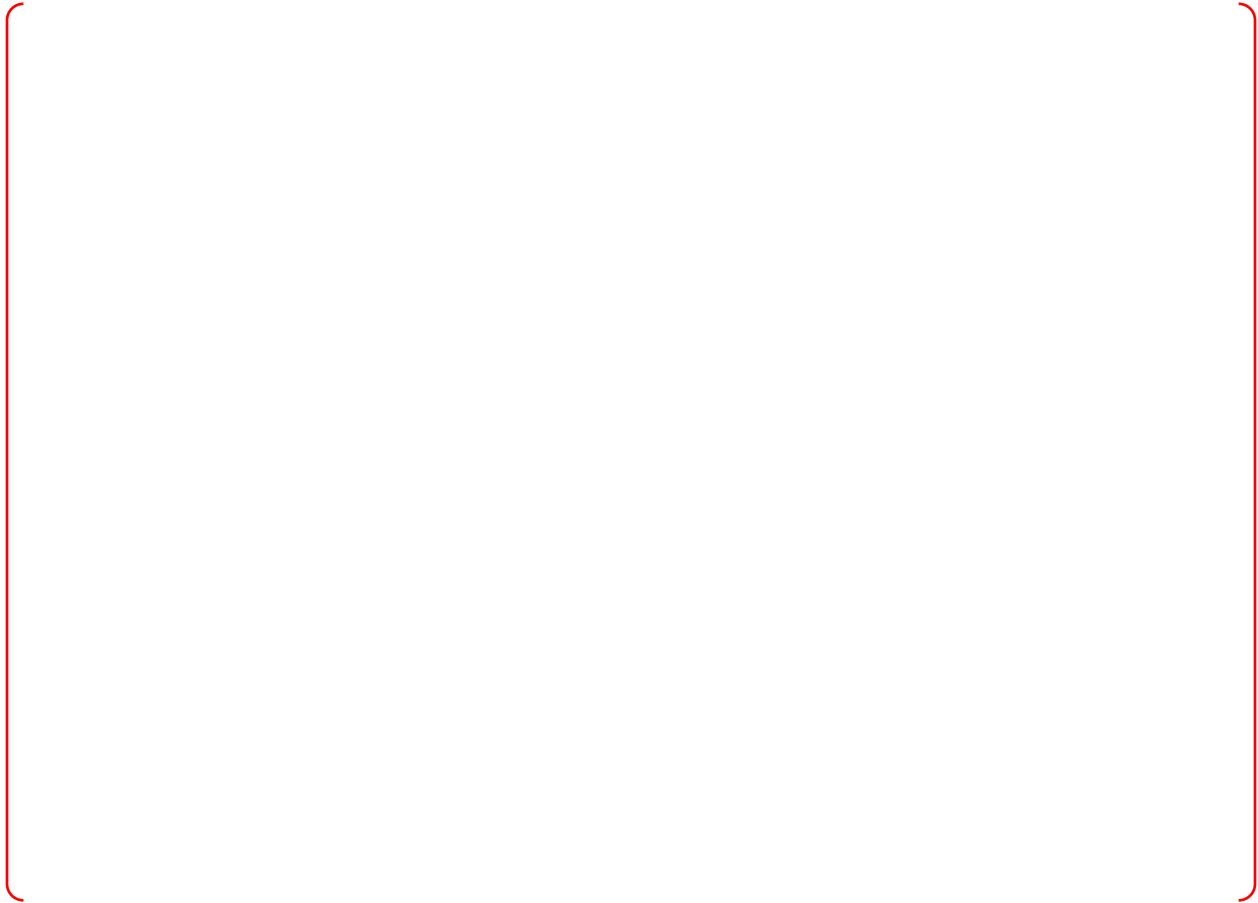


Figure 3. Roof Areas above Auxiliary Building El. 195'-0"

4. Shielding design of Room 063-P73 is based on the use of a multi-source gamma calibrator. The gamma source of the calibrator is located in a lead cylinder block and the calibrator has a collimator, which is faced to the west shield wall during calibration operation as shown in Figure 4 below. Therefore, since the east wall is located in the opposite direction, there is no direct exposure from the calibration source. Based on the shielding calculation for the instrument calibrator facility room using MCNP code, it was evaluated that the minimum required thickness of 18 inches would be sufficient to meet the radiation zoning criteria for the east wall.



Figure 4. Schematic Drawing Showing Direction of Calibration Operation

5. The "Note 1" in Figure 12.3-10 will be deleted.
6. a. "Note 1" will be added in Figure 12.3-13.
 - b. The minimum required shield thicknesses for the Future Extension Area (100-P07), which are determined based on the same design basis with Truck Bay (100-P08), will be added in Table 12.3-4. Please refer to the response to Question 12.03-08.
7. The purpose of waste drum transfer room (100-P60) is to lift packaged DAW compact drums from the DAW dryer and dewatering equipment room (085-P24), which is located just below the waste transfer room and includes the DAW compactor, through a removable hatch using a lifting tool and transfer the drums to the compound building truck bay near the waste drum storage area (100-P09) via a corridor by the use of cart.

In the truck bay, the radwaste crane installed in the truck bay is used for moving the packaged DAW waste drums to the waste drum storage area (100-P09) and placing the drum in an appropriate storage location.

During the transportation of the drum, a shielded drum cask may be used when the surface dose of the package drum exceeds the dose range established for the corridor

in order to minimize the operational exposure during the packaged waste drum transportation.

8. Holdup Volume Tank (HVT) does not contain any radioactive sources during normal operation. It is used to control the pH of the IRWST water by dissolving the Tri-sodium Phosphate (TSP) stored in the HVT only during post-accident conditions. The shield thickness provided for the west wall of the HVT in Table 12.3-4 is for the primary shield wall. The thicknesses for the north and south walls are determined to provide limited access into the HVT during refueling maintenance from the RCS piping. Since there are no sources in the left and right sides of the east wall, no specific shielding is required for the east wall.
9. Since ICI cavity, Reactor Cavity, and HVT are open to the containment atmosphere, shielding requirements for these areas are not provided. However, since the areas below these rooms are ground, Table 12.3-4 will be updated. Please see Item No. 1 of Question 12.03-08.

Since the IRWST is located below the Reactor Drain Tank (RDT) and Letdown Heat Exchanger (LHX) Rooms, the shielding for the floors of these rooms are not required. However, shielding is required for the ceilings of the RDT and LHX, and the ceiling and floor of the Regenerative Heat Exchanger (RHX) room, additional shield thicknesses for these rooms will be included in DCD Table 12.3-4, please see Item No. 1 of Question 12.03-08.

10. The Pressurizer is separated from the operating floor with a minimum of 33-inch shield wall. Steam generators, reactor coolant pumps and associated RCS piping are also separated from the operating floor and the annulus area by the secondary shield wall with a minimum thickness of 48 inches. Minimum shield thicknesses for these areas will be added in DCD Table 12.3-4, please see Item No. 1 of Question 12.03-08. In addition, DCD Subsection 12.3.2.1 will be updated to provide this information.
 11. Limited access to the containment is allowed during power operation. Annulus areas outside the secondary shield walls are allowed with a limited occupancy. DCD Subsection 12.3.2.3 will be updated.
 12. The symbol that resembles an "X" with dotted lines indicates a removable shield wall, which is used to bring equipment in or out of the each cubicle. Since this symbol is typically used in layout drawings (e.g. Figure 1.2-12), an addition of a legend only for this symbol is not necessarily required in the radiation zone drawings.
 13. In the cubicles, where significantly high radiation sources are located, a double labyrinth entrance is considered. If the height of labyrinth wall is lower than the height of the ceiling, a roof slab of the labyrinth is provided. In order to indicate the labyrinth wall under the labyrinth roof the dashed lines are used in the drawings. If the wall of the labyrinth reaches the ceiling, the solid lines are used to show the labyrinth wall.
-

Impact on DCD

DCD Figure 12.3-10, 12.3-13, Subsection 12.3.2.1, and 12.2.2.3 will be revised as indicated in Attachment 1,2,3, and 4, respectively.

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.

APR1400 DCD TIER 2

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 12.3-10 Radiation Zones (Normal) Compound Building El. 63'-0"

APR1400 DCD TIER 2

Security-Related Information – Withhold Under 10 CFR 2.390

Figure 12.3-13 Radiation Zones (Normal) Compound Building El. 100'-0"

APR1400 DCD TIER 2

The four (4) I&C equipment rooms house the safety related instrument and control systems, which require infrequent access to perform the vital function. The design dose for these areas shall not exceed TEDE of 50 mSv. The I&C equipment rooms are located in the auxiliary building at an elevation of 47.5 m (156.0 ft). The locations of the class 1E switchgear rooms and associated access routes are shown in Figure 12.3-40.

g. Access areas outside the CS and SC pump rooms

The areas outside the CS and SC pump rooms are irregularly accessed, when the manual actuation is required after post-accident situations. The design dose for these areas shall not exceed TEDE of 50 mSv. These areas are located in the auxiliary building at an elevation of 16.8 m (55.0 ft). The locations of these areas and associated access routes are shown in Figure 12.3-20.

12.3.2 Shielding

The shielding design is based on the source terms, design dose rates, and established design criteria in Subsection 12.2.1 and is in accordance with the calculation method and guidance in NRC RG 1.69 (Reference 10) and NRC RG 8.8.

12.3.2.1 General Shielding Design Criteria

Shield walls are provided around components that contain and handle radioactive materials for worker safety and to maintain radiation doses ALARA. The wall thicknesses listed in Table 12.3-4 are based on the shielding basis source terms of the component, the design dose rate, and the shielding material. This approach is consistent with NRC RG 8.8.

The shielding design for the MCR and the primary shielding in the reactor containment building is safety related. The shielding for the MCR meets the requirements of 10 CFR Part 50, Appendix A, GDC 19.

Radiation protection of personnel, equipment, and materials is dependent primarily on the adequacy of the design of the plant shielding. Radiation shielding has the passive protection function of radiation attenuation and consists of materials placed between

Pressurizer is separated from the operating floor with a minimum of 33-inch shield wall. Steam generators, reactor coolant pumps and associated RCS piping are also separated from the operating floor and the annulus area by the secondary shield wall with a minimum thickness of 48 inches.

APR1400 DCD TIER 2

provided for all accessible plant areas capable of radiation levels greater than 1 Gy/hr. Areas with the potential for radiation greater than 1 Gy/hr are listed in Table 12.3-5.

Transient sources greater than 1 Gy/hr are considered in the shielding design to provide reasonable assurance that adequate shielding is provided. One such source is a spent fuel assembly. During transfer of a spent fuel assembly through the fuel transfer tube, adjacent areas may have elevated radiation levels. Streaming from this source up through the joint between the reactor containment building and the auxiliary building has been a concern for the current generation of nuclear plants. The APR1400 design uses connected building structures to reduce the potential for streaming. In addition, sufficient concrete shielding is provided to maintain radiation levels in adjacent areas ALARA during spent fuel transfer. This permits personnel to perform maintenance and inspection activities in a lower-radiation area and reduces the potential for high-radiation levels adversely affecting refueling outage schedules. An inspection area is provided for the fuel transfer tube. Access control is provided by the personnel airlock through the reactor containment building.

Sufficient shielding provides reasonable assurance that the areas adjacent to the spent fuel transfer tube are accessible and expected radiation zones are consistent with those in Figure 12.3-52 during transfer of a spent fuel assembly. The shielding design of the fuel transfer tube is based on the 100 hr decayed spent fuel source strengths provided in Table 12.2-9. The gamma source strengths given in units of [MeV/W-sec] are converted to [photons/sec] by multiplying the gamma source strength values by the thermal power per fuel assembly in [W] and dividing by the source energy in [MeV]. Then, the shielding source term is determined by multiplying this calculated value by the radial power peaking factor of 1.55 and by the number of fuel assemblies transferred through the transfer tube, which is two (2).

Typically, pipe chases do not need to be accessed frequently. The APR1400 design minimizes locating components such as valves in pipe chases to minimize plant personnel access to pipe chases and to reduce the potential for radiation exposure. When access is needed, radiation protection personnel conduct a survey of the area to determine the strength and location of radiation sources within the pipe chase. Temporary shielding is used to minimize personnel exposure. If the primary source of radiation in the pipe chase is spent resin or slurry transfer piping, precautions are taken by operating personnel to provide reasonable assurance that no spent resin is transferred while personnel are in the

Limited access to the containment is allowed during power operation. Annulus areas outside the containment secondary shield walls are allowed with a limited occupancy.

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.: 141-8098
SRP Section: 12.03-12.04 - Radiation Protection Design Features
Application Section: 12.3
Date of RAI Issue: 08/07/2015

Question No. 12.03-10

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.

10 CFR 50, Appendix A, Criterion 61 requires in part that radioactive waste systems and other systems which may contain radioactivity contain suitable shielding for radiation protection.

GUIDANCE

SRP 12.3-12.4 indicates that the shielding should be specified for each of the radiation sources identified in Chapter 11 and Section 12.2, and other applicable sections.

Regulatory Guide 8.8 and the SRP indicates that radiation shielding should be based on an assumed 0.25% fuel cladding failure and that shield design features should reflect consideration to maintain occupational radiation exposure ALARA.

ISSUE

FSAR Figure 12.3-11 includes room 077-P01 (Hot Pipe Way) which covers a large portion of the Compound Building at that elevation. Although the elevation of the figure is not labeled, FSAR Table 12.3-5 indicates that it is the 77 foot elevation. It is located between elevation 63 (Figure 12.3-10) foot and elevation 85 foot (Figure 12.3-12) so that rooms on the 63 foot elevation that do not have the hot pipe way overhead (or one of a few other small areas on Figure 12.3-11) would appear to have a higher ceiling expanding to the 85 foot elevation. 077-P01 is identified as an area that could potentially exceed 1 Gray/hour. FSAR Table 12.3-4 lists minimum shield wall thicknesses for the north, south, east, and west of the room, however, 077-P01 is not rectangular and it is unclear which walls the values in Table 12.3-4 even apply to. In addition, in reviewing Figures 12.3-10 and 12.3-12 there appears to be a staircase going from elevation 63

foot to elevation 85 foot through the center of 077-P01, which is not indicated on Figure 12.3-11. There are also other openings or areas where columns go through 077-P01 (it is unclear what these openings represent). It does not appear that the shielding design or zoning even considers these openings, including the stairwell. Because of these vagueness and missing information, it is impossible for staff to conduct a shielding review for room 077-P01. Based on this and the above mentioned requirements and guidance, staff requests the following information:

INFORMATION REQUESTED:

1. All other Chapter 12 figures include the elevation in the figure title. Please specify the elevation of Figure 12.3-11 in the title or on the figure.
2. Please identify the staircase going from elevation 63 foot to elevation 85 foot through 077-P01, in FSAR Figure 12.3-11.
3. For the other openings going through 077-P01, please indicate if they are for building supports, openings to the room below, etc., so that it is clear to staff if these areas require shielding.
4. Please clearly indicate the minimum wall thicknesses for each wall of room 077-P01, including the walls between room 077-P01 and the staircase going through it and any of the other openings that open to the rooms below or for which shielding would be required to maintain doses to adjacent areas ALARA. Due to the unique configuration of room 077-P01, and the number of walls associated with it, staff suggests providing the specific wall thicknesses for each wall on FSAR Figure 12.3-11. In any case, the FSAR should be clear what the thickness for each wall is that requires shielding.

Response

1. The elevation of the partial plan in DCD Figure 12.3-11 is 77'-0". The title of this figure will be updated as.
2. There is no staircase accessible to the room 077-P01. Room 077-P01 is accessible by ladder from El. 85'-0" floor through the hatches. The staircase going from El. 63'-0" to 85'-0" is separated from room 077-P01.
3. The other openings are for elevator, stair, HVAC chase, and etc., which are indicated in Figure 1. The walls around these openings are designed not only to support the above slabs but also to shield the gamma radiation from the hot pipe way. Therefore, the minimum thicknesses of the walls around these openings are determined considering the shielding requirements. Required minimum shield thicknesses are provided in Figure 2 below.



Figure 1. Openings of Hot Pipe Way (Room 077-P01)

4. Since room 077-P01 has many rooms adjacent to it, it is difficult to provide the shield thicknesses in Table 12.3-4. Therefore, Figure 2 is provided for staff's review.

TS

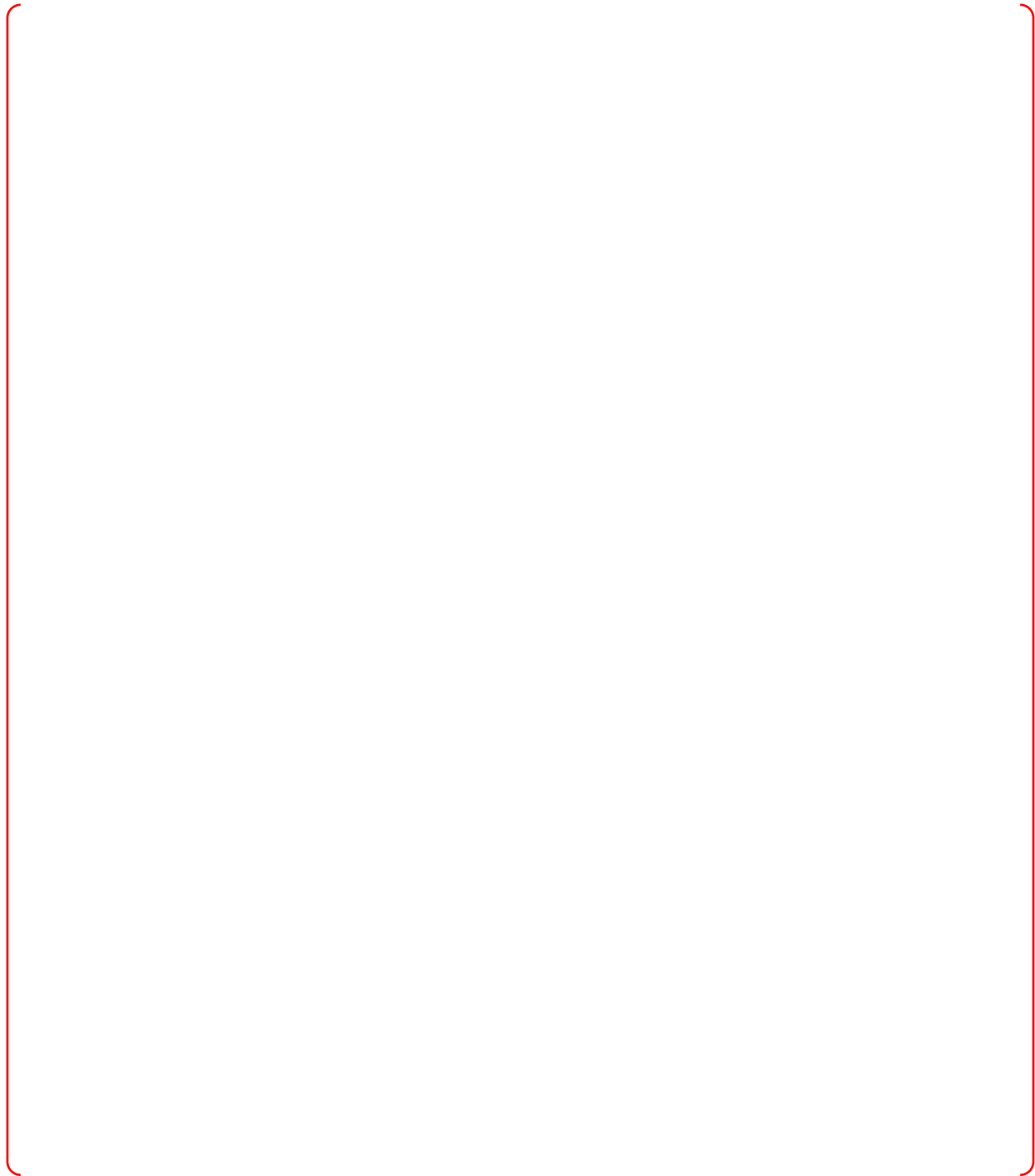


Figure 2 Minimum Required Shield Thickness for Room 077-P01

Impact on DCD

The title of the Figure 12.3-11 will be revised as indicated in Attachment.

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.

APR1400 DCD TIER 2

Security-Related Information – Withhold Under 10 CFR 2.390

El. 77'-0"

Figure 12.3-11 Radiation Zones (Normal) Compound Building Partial Plan