
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.: 116-8054
SRP Section: 14.03.08 – Inspections, Tests, Analyses, and Acceptance Criteria
Application Section: 14.03.08
Date of RAI Issue: 07/27/2015

Question No. 14.03.08-1

10 CFR 50, GDC 61, requires that the fuel storage and handling, radioactive waste, and other systems which may contain radioactivity shall be designed to assure adequate safety under normal and postulated accident conditions. These systems shall be designed (1) with a capability to permit appropriate periodic inspection and testing of components important to safety, (2) with suitable shielding for radiation protection, (3) with appropriate containment, confinement, and filtering systems, (4) with a residual heat removal capability having reliability and testability that reflects the importance to safety of decay heat and other residual heat removal, and (5) to prevent significant reduction in fuel storage coolant inventory under accident conditions.

SRP Section 14.3 indicates that the purpose of inspections, tests, analysis, and acceptance criteria (ITAAC), is to verify that a facility referencing the design certification is built and operates in accordance with the design certification and applicable regulations.

In addition, SRP Section 14.3.8 indicates that the reviewer should ensure that Tier 1 identifies and describes, commensurate with their safety significance, those SSCs that provide radiation shielding, confinement or containment of radioactivity, ventilation of airborne contamination, or radiation (or radioactivity concentration) monitoring for normal operations and during accidents.

SRP Section 14.3.8 also indicates that the criteria in Tier 1 should ensure that the radiation shielding design (as provided by the plant structures or by permanent or temporary shielding included in the design) is adequate so that the maximum radiation levels in plant areas are commensurate with the areas' access requirements; that adequate shielding is provided for those plant areas that may require occupancy to permit an operator to aid in the mitigation of or the recovery from an accident; and that the contribution of gamma shine to the radiation dose to a member of the public (off site) will be a small fraction of the U.S. Environmental Protection Agency's dose limits in found at 40 CFR Part 190.

Tier 1, Table 2.8-2, "Radiation Protection ITAAC," item 1, is associated with radiation shielding. The acceptance criteria indicates that a report exists which verifies that radiation levels are within those levels specified in Tier 1, Table 2.8-1. Table 2.8-1 only provides the dose rate range for each zone designation and does not provide the specific zoning for any of the rooms in the plant. Therefore, there is no way for anyone to verify that this ITAAC has been completed during facility construction. In addition, Tier 1, Table 2.8-2, item 1, indicates that the plant will be built and then a report will be completed to determine that radiation zoning requirements are met. Therefore, Tier 1, Table 2.8-2, Item 1, is written as a design acceptance criteria (DAC), instead of an ITAAC. It is unclear why a DAC would be needed for radiation shielding when Tier 2 already provides minimum radiation shielding thicknesses for radiation sources large enough to require shielding.

Therefore, Tier 1, Table 2.8-2, item 1 is unacceptable. To provide appropriate ITAAC for radiation shielding, staff suggests the following:

1. The applicant should modify or replace Tier 1, Table 2.8-2, item 1 with an ITAAC to verify that minimum shielding requirements are met for significant radiation sources which require radiation shielding. Using this approach, Tier 1, Section 2.8 and item 1 in Table 2.8-2 should provide the shielding material for each room (for example, concrete) as well as the thickness of each shield, for significant sources which require shielding.
2. If shielding material other than concrete or steel is being relied upon for limiting radiation exposure to workers or members of the public, or for limiting exposure to equipment in the equipment qualification program, the applicant should discuss the material used in Tier 1 and Tier 2 of the application and include an ITAAC to verify that the shield material maintains its integrity during normal operation and accident conditions, as appropriate.
3. Provide figures of the general arrangement of the plant in Tier 1, which should also be referenced in the shielding ITAAC, making it clear what areas of the plant are being shielded and where the major radiation sources are located.
4. Finally, if any doors are required to provide radiation shielding from significant plant sources Tier 1 should discuss the radiation attenuation capabilities of those doors and ITAAC should be provided to verify the attenuation capabilities. The ITAAC should verify that the doors provide equal or greater attenuation than that of the wall to which they are installed.

Response – Rev. 1

1. KHNP will revise the ITAAC in Table 2.8-2, item 1 to reflect an inspection and analysis based on the type of construction material used for the shielding and the [thicknesses](#) of the floors and walls for rooms that contain significant radiation sources which require shielding.

[Tier 1 Table 2.2.1-1 will also be revised to indicate the specific thicknesses of floors and walls. The information on the design basis radiation shield thicknesses around the major cubicles and the other structure thicknesses will be added to Tier 1. In addition,](#)

[new table will be added, Table 2.2.1-1a, which provides the shield thicknesses for the compound building and tanks located in the yard area.](#)

2. Steel reinforced concrete is used for all shield walls and floors. The radwaste truck bay door is designed for shielding during waste handling. Please refer to item 4 below.
3. In addition to general arrangement drawings, other drawings such as radiation zone drawings, radiation shield barrier drawings, and concrete outline drawings are to be used for inspecting the thicknesses of the shield walls and floors. The radiation shield barrier drawings provides clear areas of the facility being shielded, and the minimum shield wall thicknesses are also indicated on the drawings. A paragraph will be added to the end of DCD Tier 1 Subsection 2.8.2 to reference the type of drawings and construction reports (for verification of concrete densities and reinforced steel bars) for inspection and analysis.

Due to the large number of drawings that will be used for the shielding inspections, only the types of drawings are noted in the DCD Tier 1 subsection.

4. The compound building truck bay door is designed to provide shielding during waste loading and unloading operations. The truck bay door will be inspected against the technical specifications for its attenuation capability through the comparison to its manufacturer's test report. An ITAAC will be added to Table 2.8-2 for the compound building truck bay door.

Impact on DCD

DCD Tier 1, Subsections 2.8.1, 2.8.2, [Table 2.2.1-1](#), and Table 2.8-2 will be revised and [Table 2.2.1-1a will be added](#) 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 Environment Report.

2.8 Radiation Protection

2.8.1 Design Description

Radiation protection design features in the APR1400 provide the limitation of radiation exposures to plant personnel and to the public complying with the NRC RG and as low as reasonably achievable (ALARA) principles.

The design commitments for radiation protection are as follows:

1. Shielding design of rooms, corridors, cubicles, labyrinth access, and operating areas is commensurate with ~~their access requirement and radiation levels for walls surrounding very high radiation areas and significantly high radiation areas.~~ the minimum shielding requirements for significant radiation sources which require shielding
2. Ventilation systems for the radiological controlled areas are designed to keep the radiation exposure below the limits specified in 10 CFR Part 20, Appendix B.
3. Area and airborne radioactivity monitoring systems are located in the plant areas where personnel access can be restricted by the airborne contamination.
4. Radiation shielding design is provided to protect the operators so that they could take actions to mitigate or recover from the design basis accidents.

Delete

2.8.2 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.8-2 provides the inspections, tests, analyses and associated acceptance criteria, which will be undertaken for radiation protection.

5. Compound building truck bay door is provided for radiation shielding during waste loading and unloading operations.

The following drawing types are to be used for inspection and analysis of as-built shield walls and floors as applicable :

- General arrangement drawings
- Radiation zone drawings
- Radiation shield barrier drawings
- Concrete outline drawings
- Construction reports

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Table 2.8-2

Radiation Protection ITAAC

the minimum shielding requirements for significant radiation sources which require shielding

materials of construction and the thickness of all shield walls and floors are as-built for confirmation of the

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|--|--|
| 1. Shielding design of rooms, corridors, cubicles, labyrinth access, and operating areas is commensurate with their access requirement and radiation levels for walls surrounding very high radiation areas and significantly high radiation areas. | 1. Inspections and analysis based upon the as-built shielding structure will be conducted to verify the adequacy of the shielding design in plant area. | 1. A report exists and concludes that maximum radiation levels are less than or equal to the radiation levels in the radiation zones specified in Table 2.8-1. |
| 2. Ventilation systems for the radiological controlled areas are designed to keep the radioactivity concentration below the limits specified in 10 CFR Part 20, Appendix B. | 2. Analysis will be performed to predict radioactivity concentrations and to control ventilation by considering flow rates and equipment leakages in the plant areas during normal operations. | 2. Analysis exists and concludes that ventilation the lower concentrations of airborne radionuclides are in the limit specified in 10 CFR Part 20, Appendix B. |
| 3. Area and airborne radioactivity monitoring systems are located in the plant areas where personnel access can be restricted by the airborne contamination. | 3. Refer to Table 2.7.6.4-3 ITAAC # 1 and Table 2.7.6.5-3 ITAAC # 1. | 3. Refer to Table 2.7.6.4-3 ITAAC # 1 and Table 2.7.6.5-3 ITAAC # 1. |
| 4. Radiation shielding design is provided to protect the operators so that they could take actions to mitigate or recover from the design basis accidents. | 4. Analysis will be performed to predict maximum radiation exposure to the operators during the design basis accidents. | 4. A report exists and concludes that maximum radiation exposure dose to operators is less than the limits specified in GDC 19. |

in accordance with the shield barrier drawings

the shielding materials and the thicknesses of walls and floors are as-built for the shielding of all radiation areas

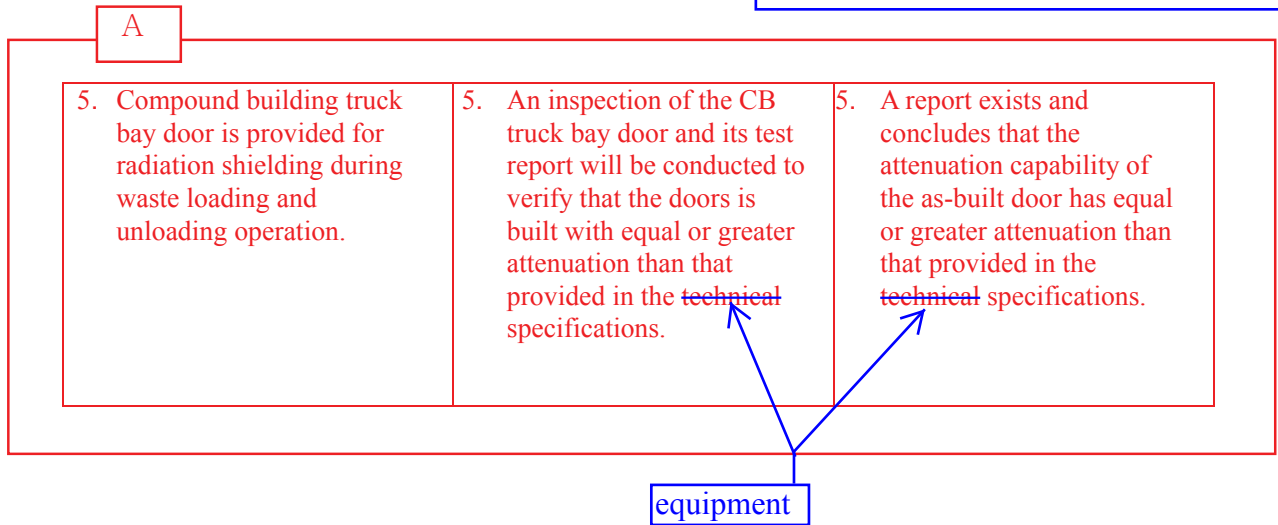
of

thicknesses

Add "A" after this table

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APR1400 DCD TIER 1

Table 2.2.1-1 (7 of 10)

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness ⁽¹⁾ | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------|------------------------------------|-----------------------------------|--|
| Column Line AA Wall | From 12 to 17 From 20 to 26 | From 55'-0" to 156'-0" | 4'-0" | Yes |
| Column Line AA Wall | From 17 to 20 | From 55'-0" to 175'-0" | 5'-0" | Yes |
| Column Line AB Wall | From 12 to 15 | From 55'-0" to 100'-0" | 3'-0" | Yes |
| Column Line AB Wall | From 15 to 22 | From 55'-0" to 137'-6" | 4'-0" | Yes |
| Column Line AB Wall | From 23 to 26 | From 55'-0" to 137'-6" | 3'-0" | Yes |
| Column Line AB Wall | From 22 to 23 | From 78'-0" to 156'-0" | 3'-6"/3'-0" | Yes |
| Column Line AB Wall | From 12 to 18 | From 137'-6" to 156'-0" | 4'-0" | No |
| Column Line AB Wall | From 12 to 17 | From 156'-0" to 195'-0" | 3'-0" | Yes |
| Column Line AB Wall | From 20 to 22 | From 137'-6" to 156'-0" | 3'-6" | Yes |
| Column Line AB Wall | From 20 to 22 | From 156'-0" to 180'-0" | 3'-0" | Yes |
| Column Line AC Wall | From 12 to 14 | From 55'-0" to 100'-0" | 2'-6" | Yes |
| Column Line AC Wall | From 15 to 26 | From 55'-0" to 68'-0" | 4'-0" | Yes |
| Column Line AC Wall | From 15 to 23 | From 68'-0" to 137'-6" | 4'-0" | Yes |
| Column Line AC Wall | From 23 to 26 | From 100'-0" to 156'-0" | 3'-0" | Yes |
| Column Line AC Wall | From 12 to 14 | From 137'-6" to 156'-0" | 2'-6" | No |
| Column Line AC Wall | From 15 to 18 | From 137'-6" to 156'-0" | 4'-0" | No |
| Column Line AC Wall | From 20 to 22 | From 137'-6" to 169'-6" | 3'-0" | Yes |
| Column Line AC Wall | From 24 to 26 | From 137'-6" to 156'-0" | 3'-0" | No |
| Column Line AC Wall | From 15 to 17 | From 156'-0" to 195'-0" | 3'-0" | No |



Column Line AB Wall From 22 to 26 From 156'-0" to 174'-0" 2'-0" Yes

APR1400 DCD TIER 1

Table 2.2.1-1 (10 of 10)

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness ⁽¹⁾ | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------|--|-----------------------------------|--|
| Column Line AK Wall | From 12 to 17 From 20 to 26 | From 55'-0" to 156'-0" From 55'-0" to 174'-0" | 4'-0" | Yes |
| Column Line AK Wall | From 17 to 20 | From 55'-0" to 175'-0" | 5'-0" | Yes |
| Column Line AK Wall | From 20 to 23 | From 174'-0" to 216'-9" | 3'-0" | Yes |
| Column Line AK Wall | From 23 to 26 | From 174'-0" to 213'-6" | 4'-0" | Yes |
| Floors | Not Applicable | 68'-0" | Variable From 2'-0" to 2'-6" | Yes |
| Floors | Not Applicable | 78'-0" | Variable From 1'-6" to 3'-3" | Yes |
| Floors | Not Applicable | 100'-0" | Variable From 1'-6" to 4'-0" | Yes |
| Floors | Not Applicable | 120'-0" | Variable From 1'-6" to 6'-1" | Yes |
| Floors | Not Applicable | 137'-6" | Variable From 1'-6" to 4'-6" | Yes |
| Floors | Not Applicable | 156'-0" | Variable From 1'-0" to 3'-0" | Yes |
| Floors | Not Applicable | 174'-0" | Variable From 1'-0" to 1'-6" | Yes |
| Floors | Not Applicable | From 195'-0" to 216'-9" | Variable From 1'-6" to 2'-9" | Yes |

- (1) Tolerance for the thickness of the walls and slabs is -1/4 inch and + 1 inch.
- (2) Reduction of the basemat thickness is less than - 5 % of specified thickness.

Add table contents for the AB floors as indicated in "A"

Add new table "Table 2.2.1-1a" as shown in "B" following Table 2.2.1-1.

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------------|--------------------------------|------------------------------------|--------------------|--|
| Wall located between Column Lines | From AB to AE From 23 to 24 | From 68'-0" to 78'-0" | 3'-0" | Yes |
| Wall located between Column Lines | From AB to AD From 24 to 25 | From 68'-0" to 78'-0" | 3'-0" | Yes |
| Wall located between Column Lines | From AA to AB From 24 to 25 | From 77'-0" to 100'-0" | 3'-6" | Yes |
| Wall located between Column Lines | From AD to AE From 25 to 26 | From 78'-0" to 100'-0" | 3'-0" | Yes |
| Wall located between Column Lines | From AD to AE From 24 to 25 | From 78'-0" to 100'-0" | 2'-0" | Yes |
| Wall located between Column Lines | From AC to AD From 23 to 24 | From 86'-0" to 100'-0" | 3'-0" | Yes |
| Wall located between Column Lines | From AG to AI From 21 to 22 | From 100'-0" to 120'-0" | 3'-0" | Yes |
| Wall located between Column Lines | From AA to AB From 20 to 22 | From 156'-0" to 174'-0" | 2'-0" | Yes |

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------|------------------------------------|---------------------|--|
| Floors | From AJ to AK From 25 to 26 | 68'-0" | 1'-6" | Yes |
| Floors | From AI to AJ From 23 to 26 | 68'-0" | 2'-0", 2'-6" | Yes |
| Floors | From AF to AI From 23 to 26 | 68'-0" | 2'-0", 2'-6" | Yes |
| Floors | From AE to AF From 23 to 25 | 68'-0" | 2'-0" | Yes |
| Floors | From AD to AE From 23 to 25 | 68'-0" | 2'-0", 2'-6" | Yes |
| Floors | From AE to AF From 25 to 26 | 68'-0" | 2'-0", 2'-6" | Yes |
| Floors | From AB to AD From 23 to 24 | 68'-0" | 2'-6" | Yes |
| Floors | From AD to AE From 25 to 26 | 68'-0" | 2'-0", 2'-6" | Yes |
| Floors | From AA to AD From 24 to 26 | 68'-0" | 2'-4", 2'-6" | Yes |
| Floors | From AB to AD From 24 to 25 | 77'-0" | 2'-0", 2'-6", 3'-3" | Yes |

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------------|------------------------------------|--------------------|--|
| Floors | From AK to Above AK From 15 TO 19 | 78'-0" | 1'-6" | Yes |
| Floors | From AJ to AK From 13 to 15 | 78'-0" | 2'-6" | Yes |
| Floors | From AH to AJ From 15 to 19 | 78'-0" | 2'-6" | Yes |
| Floors | From AB to AJ From 23 to 26 | 78'-0" | 2'-0" | Yes |
| Floors | From AA to AB From 25 to 26 | 78'-0" | 2'-0" | Yes |
| Floors | From AA to AB From 24 to 25 | 78'-0" | 2'-6", 3'-0" | Yes |
| Floors | From AA to AB From 23 to 24 | 78'-0" | 2'-6" | Yes |
| Floors | From AE to AG From 22 to 23 | 78'-0" | 2'-0" | Yes |
| Floors | From AG to AI From 20 to 23 | 78'-0" | 3'-0" | Yes |
| Floors | From AC to AE From 20 to 23 | 78'-0" | 3'-0" | Yes |

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------------|------------------------------------|--------------------|--|
| Floors | From AI to AJ From 19 to 22 | 78'-0" | 2'-6" | Yes |
| Floors | From AB to AC From 19 to 22 | 78'-0" | 2'-6" | Yes |
| Floors | From AB to AD From 15 to 19 | 78'-0" | 2'-6" | Yes |
| Floors | From Below AA to AA From 15 to 19 | 78'-0" | 1'-6" | Yes |
| Floors | From AA to AB From 13 to 15 | 78'-0" | 2'-6" | Yes |
| Floors | From AJ to AK From 23 to 26 | 78'-0" | 2'-6" | Yes |
| Floors | From AJ to AK From 14 to 15 | 78'-0" | 2'-6" | No |
| Floors | From AJ to AK From 22 to 23 | 78'-0" | 2'-6" | No |
| Floors | From AJ to AK From 12 to 13 | 78'-0" | 1'-6" | No |
| Floors | From AJ to Ak From 15 to 22 | 78'-0" | 1'-6" | No |

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------|------------------------------------|--------------------|--|
| Floors | From AB to AJ From 12 to 15 | 78'-0" | 1'-6" | No |
| Floors | From AE to AG From 15 to 17 | 78'-0" | 1'-6" | No |
| Floors | From AA to AB From 12 to 13 | 78'-0" | 1'-6" | No |
| Floors | From AA to AB From 14 to 15 | 78'-0" | 2'-6" | No |
| Floors | From AA to AB From 15 to 16 | 78'-0" | 1'-6", 2'-6" | No |
| Floors | From AA to AB From 16 to 22 | 78'-0" | 1'-6" | No |
| Floors | From AA to AB From 22 to 23 | 78'-0" | 2'-6" | No |
| Floors | From AB to AC From 22 to 23 | 78'-0" | 1'-6" | No |
| Floors | From AB to AD From 24 to 26 | 86'-0" | 2'-0", 3'-3" | Yes |
| Floors | From AH to AI From 17 to 19 | 100'-0" | 2'-0" | Yes |

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------|------------------------------------|--------------------|--|
| Floors | From AC to AD From 17 to 19 | 100'-0" | 2'-0" | Yes |
| Floors | From AE to AF From 22 to 23 | 100'-0" | 2'-0" | Yes |
| Floors | From AJ to AK From 24 to 26 | 100'-0" | 2'-0" | Yes |
| Floors | From AC to AD From 24 to 26 | 100'-0" | 2'-0" | Yes |
| Floors | From AD to AE From 24 to 25 | 100'-0" | 4'-0" | Yes |
| Floors | From AG to AI From 21 to 23 | 100'-0" | 3'-0" | Yes |
| Floors | From AD to AJ From 25 to 26 | 100'-0" | 2'-0" | Yes |
| Floors | From AC to AE From 21 to 23 | 100'-0" | 3'-0" | Yes |
| Floors | From AE to AF From 24 to 25 | 100'-0" | 3'-0" | Yes |
| Floors | From AH to AI From 23 to 25 | 100'-0" | 2'-0" | Yes |

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------|------------------------------------|--------------------|--|
| Floors | From AI to AJ From 23 to 25 | 100'-0" | 3'-6" | Yes |
| Floors | From AG to AH From 21 to 23 | 100'-0" | 3'-0" | Yes |
| Floors | From AE to AF From 24 to 25 | 100'-0" | 3'-0" | Yes |
| Floors | From AH to AK From 12 to 13 | 100'-0" | 2'-0" | No |
| Floors | From AH to AK From 14 to 15 | 100'-0" | 2'-0" | No |
| Floors | From AJ to AK From 15 to 24 | 100'-0" | 2'-0" | No |
| Floors | From AI to AJ From 21 to 23 | 100'-0" | 2'-0" | No |
| Floors | From AG to AI From 15 to 17 | 100'-0" | 2'-0" | No |
| Floors | From AH to AI From 19 to 20 | 100'-0" | 2'-0" | No |
| Floors | From AD to AH From 12 to 15 | 100'-0" | 2'-0" | No |

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------|------------------------------------|--------------------|--|
| Floors | From AA to AD From 12 to 13 | 100'-0" | 2'-0" | No |
| Floors | From AA to AD From 14 to 15 | 100'-0" | 2'-0" | No |
| Floors | From AC to AE From 15 to 17 | 100'-0" | 2'-0" | No |
| Floors | From AA to AB From 15 to 23 | 100'-0" | 2'-0" | No |
| Floors | From AC to AD From 19 to 20 | 100'-0" | 2'-0" | No |
| Floors | From AB to AC From 21 to 22 | 100'-0" | 2'-0" | No |
| Floors | From AA to AF From 23 to 24 | 100'-0" | 2'-0" | No |
| Floors | From AA to AC From 24 to 26 | 100'-0" | 2'-0" | No |
| Floors | From AI to AJ From 23 to 24 | 100'-0" | 3'-6" | No |
| Floors | From AH to AK From 13 to 14 | 100'-0" | 4'-0" | No |

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|----------------------------------|------------------------------------|--------------------|--|
| Floors | From AA to AD From 13 to 14 | 100'-0" | 4'-0" | No |
| Floors | From AI to AJ From 15 to 21 | 100'-0" | 4'-0" | No |
| Floors | From AB to AC From 15 to 21 | 100'-0" | 4'-0" | No |
| Floors | From AH to AI From 20 to 22 | 100'-0" | 2'-6" | No |
| Floors | From AG to AI From 22 to 23 | 100'-0" | 2'-6" | No |
| Floors | From AC to AD From 20 to 22 | 100'-0" | 2'-6" | No |
| Floors | From AF to AG From 22.4 to 24 | 113'-0", 114'-6" | 5'-4" | Yes |
| Floors | From AG to AH From 23 to 25 | 114'-0" | 6'-1" | Yes |
| Floors | From AD to AE From 25 to 26 | 117'-0" | 1'-6" | Yes |
| Floors | From AF to AG From 24 to 25 | 118'-5" | 4'-6" | Yes |

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------|------------------------------------|--------------------|--|
| Floors | From AH to AI From 17 to 19 | 120'-0" | 1'-6" | Yes |
| Floors | From AC to AD From 17 to 19 | 120'-0" | 1'-6" | Yes |
| Floors | From AE to AF From 25 to 26 | 120'-0" | 1'-6" | Yes |
| Floors | From AB to AC From 21 to 22 | 120'-0" | 2'-0" | Yes |
| Floors | From AC to AD From 22 to 23 | 120'-0" | 1'-6" | Yes |
| Floors | From AD to AF From 21 to 23 | 120'-0" | 1'-6" | Yes |
| Floors | From AG to AK From 25 to 26 | 120'-0" | 1'-6" | Yes |
| Floors | From AH to AJ From 12 to 13 | 120'-0" | 1'-6" | No |
| Floors | From AH to AK From 14 to 15 | 120'-0" | 1'-6" | No |
| Floors | From AJ to AK From 19 to 25 | 120'-0" | 1'-6" | No |

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------|------------------------------------|--------------------|--|
| Floors | From AG to AI From 15 to 17 | 120'-0" | 1'-6" | No |
| Floors | From AH to AI From 21 to 22 | 120'-0" | 1'-6" | No |
| Floors | From AD to AH From 12 to 15 | 120'-0" | 1'-6" | No |
| Floors | From AC to AE From 15 to 17 | 120'-0" | 1'-6" | No |
| Floors | From AB to AD From 12 to 13 | 120'-0" | 1'-6" | No |
| Floors | From AA to AD From 14 to 15 | 120'-0" | 1'-6" | No |
| Floors | From AA to AB From 18 to 23 | 120'-0" | 1'-6" | No |
| Floors | From AA to AD From 23 to 26 | 120'-0" | 1'-6" | No |
| Floors | From AD to AF From 23 to 24 | 120'-0" | 1'-6" | No |
| Floors | From AE to AF From 24 to 25 | 120'-0" | 1'-6" | No |

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------|------------------------------------|--------------------|--|
| Floors | From AJ to AK From 15 to 19 | 120'-0" | 2'-6" | No |
| Floors | From AA to AB From 15 to 19 | 120'-0" | 2'-6" | No |
| Floors | From AB to AC From 20 to 21 | 137'-6" | 4'-0" | Yes |
| Floors | From AH to AI From 22 to 23 | 137'-6" | 2'-3" | Yes |
| Floors | From AA to AE From 23 to 26 | 137'-6" | 1'-6", 4'-6" | Yes |
| Floors | From AD to AF From 22 to 23 | 137'-6" | 2'-0" | Yes |
| Floors | From AA to AE From 23 to 26 | 137'-6" | 1'-6", 4'-6" | Yes |
| Floors | From AD to AF From 22 to 23 | 137'-6" | 2'-0" | Yes |
| Floors | From AG to AH From 22 to 23 | 137'-6" | 2'-6" | Yes |
| Floors | From AC to AD From 18 to 20 | 137'-6" | 1'-6" | Yes |

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------|------------------------------------|--------------------|--|
| Floors | From AH to AI From 18 to 20 | 137'-6" | 1'-6" | Yes |
| Floors | From AG to AK From 24 to 26 | 137'-6" | 1'-6" | Yes |
| Floors | From AC to AD From 22 to 23 | 137'-6" | 2'-0" | Yes |
| Floors | From AB to AJ From 12 to 15 | 137'-6" | 1'-6" | No |
| Floors | From AG to AI From 15 to 17 | 137'-6" | 1'-6" | No |
| Floors | From AC to AE From 15 to 17 | 137'-6" | 1'-6" | No |
| Floors | From AA to AB From 20 to 23 | 137'-6" | 1'-6" | No |
| Floors | From AE to AF From 25 to 26 | 137'-6" | 1'-6" | No |
| Floors | From AH to AJ From 21 to 22 | 137'-6" | 1'-6" | No |
| Floors | From AJ to AK From 20 to 23 | 137'-6" | 1'-6" | No |

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------|------------------------------------|--------------------|--|
| Floors | From AJ to AK From 12 to 20 | 137'-6" | 4'-0" | No |
| Floors | From AI to AJ From 17 to 21 | 137'-6" | 4'-0" | No |
| Floors | From AA to AB From 12 to 20 | 137'-6" | 4'-0" | No |
| Floors | From AB to AC From 17 to 20 | 137'-6" | 4'-0" | No |
| Floors | From AI to AJ From 15 to 17 | 137'-6" | 2'-0" | No |
| Floors | From AB to AC From 15 to 17 | 137'-6" | 2'-0" | No |
| Floors | From AE to AF From 23 to 26 | 154'-6" | 3'-0" | Yes |
| Floors | From AA to AB From 20 to 21 | 156'-0" | 1'-6", 2'-0" | Yes |
| Floors | From AA to AB From 21 to 25 | 156'-0" | 2'-0" | Yes |
| Floors | From AB to AI From 12 to 15 | 156'-0" | 1'-6" | Yes |

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------|------------------------------------|---------------------|--|
| Floors | From AI to AK From 20 to 21 | 156'-0" | 1'-6" | Yes |
| Floors | From AJ to AK From 21 to 22 | 156'-0" | 1'-6" | Yes |
| Floors | From AI to AJ From 12 to 15 | 156'-0" | 1'-6" | No |
| Floors | From AG to AJ From 15 to 17 | 156'-0" | 1'-6" | No |
| Floors | From AJ to AK From 22 to 26 | 156'-0" | 1'-6" | No |
| Floors | From AG to AJ From 21 to 23 | 156'-0" | 1'-6" | No |
| Floors | From AG to AI From 24 to 26 | 156'-0" | 1'-6" | No |
| Floors | From AI to AJ From 25 to 26 | 156'-0" | 1'-6" | No |
| Floors | From AI to AJ From 23 to 25 | 156'-0" | 1'-6", 2'-0", 4'-0" | No |
| Floors | From AB to AD From 14 to 15 | 156'-0" | 1'-6" | No |

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------|------------------------------------|--------------------|--|
| Floors | From AB to AE From 15 to 17 | 156'-0" | 1'-6" | No |
| Floors | From AA to AB From 21 to 26 | 156'-0" | 1'-6" | No |
| Floors | From AB to AD From 22 to 26 | 156'-0" | 1'-6" | No |
| Floors | From AD to AE From 24 to 26 | 156'-0" | 3'-0" | No |
| Floors | From AB to AC From 20 to 22 | 169'-6" | 1'-6" | Yes |
| Floors | From AC to AI From 12 to 15 | 174'-0" | 1'-6" | Yes |
| Floors | From AI to AK From 20 to 23 | 174'-0" | 1'-6" | Yes |
| Floors | From AA to AB From 21 to 26 | 174'-0" | 1'-6" | Yes |
| Floors | From AI to AJ From 12 to 15 | 174'-0" | 1'-6" | No |
| Floors | From AG to AJ From 15 to 18 | 174'-0" | 1'-6" | No |

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------|------------------------------------|--------------------|--|
| Floors | From AJ to AK From 17 to 18 | 174'-0" | 1'-6" | No |
| Floors | From AH to AK From 18 to 20 | 174'-0" | 1'-6" | No |
| Floors | From AG to AI From 21 to 23 | 174'-0" | 1'-6" | No |
| Floors | From AB to AC From 12 to 15 | 174'-0" | 1'-6" | No |
| Floors | From AB to AE From 15 to 17 | 174'-0" | 1'-6" | No |
| Floors | From AA to AD From 17 to 20 | 174'-0" | 1'-6" | No |
| Floors | From AA to AB From 20 to 25 | 174'-0" | 2'-0" | No |
| Floors | From AB to AC From 22 to 23 | 180'-0" | 1'-6" | Yes |
| Floors | From AI to AK From 20 to 22 | 195'-0" | 1'-6" | Yes |
| Floors | From AJ to AK From 22 to 23 | 195'-0" | 1'-6" | Yes |

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------|------------------------------------|--------------------|--|
| Floors | From AI to AJ From 13 to 15 | 195'-0" | 1'-6" | No |
| Floors | From AH to AJ From 16 to 18 | 195'-0" | 1'-6" | No |
| Floors | From AJ to AK From 17 to 18 | 195'-0" | 1'-6" | No |
| Floors | From AH to AI From 13 to 14 | 195'-0" | 1'-6" | No |
| Floors | From AG to AI From 20 to 23 | 195'-0" | 1'-6" | No |
| Floors | From AD to AH From 12 to 14 | 195'-0" | 1'-6" | No |
| Floors | From AB to AD From 13 to 14 | 195'-0" | 1'-6" | No |
| Floors | From AB to AC From 14 to 15 | 195'-0" | 1'-6" | No |
| Floors | From AA to AB From 17 to 18 | 195'-0" | 1'-6" | No |
| Floors | From AB to AD From 16 to 18 | 195'-0" | 1'-6" | No |

A

| Wall or Section Description | Column Lines | Floor Elevation or Elevation Range | Concrete Thickness | Applicable Radiation Shielding Wall (Yes/No) |
|-----------------------------|--------------------------------|------------------------------------|--------------------|--|
| Floors | From AI to AJ From 12 to 13 | 195'-0" | 2'-9" | No |
| Floors | From AB to AC From 12 to 13 | 195'-0" | 2'-9" | No |
| Floors | From AC to AD From 12 to 13 | 195'-0" | 1'-6",2'-9" | No |
| Floors | From AH to AI From 12 to 13 | 195'-0" | 1'-6",2'-9" | No |
| Floors | From AH to AJ From 15 to 16 | 213'-0" | 1'-6" | No |
| Floors | From AC to AI From 14 to 15 | 213'-0" | 1'-6" | No |
| Floors | From AB to AD From 15 to 16 | 213'-0" | 1'-6" | No |
| Floors | From AI to AK From 20 to 22 | 215'-0" | 2'-0" | Yes |
| Floors | From AF to AK From 23 to 26 | 215'-0" | 1'-6" | Yes |
| Floors | From AI to AJ From 22 to 23 | 226'-6" | 1'-6" | Yes |

B

Table 2.2.1-1a (1 of 2)

Design Basis Radiation Shield Thicknesses of Compound Building and Yard Area

| Room Number | Room Name | Minimum Required Shield Thickness (inches) | | | | | |
|-------------------|---|--|-------|------|------|--------|---------|
| | | North | South | East | West | Floor | Ceiling |
| Compound Building | | | | | | | |
| 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-P23 | Equip. Waste Tank Room | 13 | 33 | 20 | 22 | Ground | 27 |
| 063-P24 | Equip. Waste Tank Room | 16 | 13 | 21 | 22 | Ground | 27 |
| 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-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-P41 | Concentrate Holding Tank Room | 21 | 27 | 33 | 28 | Ground | 10 |
| 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 |

B

Table 2.2.1-1a (2 of 2)

| Room Number | Room Name | Minimum Required Shield Thickness (inches) | | | | | |
|---------------------------|--|--|-------|------|------|--------|---------|
| | | North | South | East | West | Floor | Ceiling |
| Compound Building (Cont.) | | | | | | | |
| 063-P73 | Future Use | 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-P08 | Valve Room | 24 | 19 | 22 | 24 | 19 | 24 |
| 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-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-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-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 |
| Yard Area | | | | | | | |
| - | Boric Acid Storage Tank | 16 | | | | Ground | - |
| - | Holdup Tank | 14.75 | | | | Ground | - |