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.:	**227-8274**
SRP Section:	**03.08.04 – Other Seismic Category I Structures**
Application Section:	**SRP 3.8.4**
Date of RAI Issue:	**09/25/2015**

Question No. 03.08.04-1

10 CFR 50.55a and 10 CFR Part 50, Appendix A, General Design Criteria (GDC) 1, 2, 4 and 5 provide the regulatory requirements for the design of seismic Category I structures. Standard Review Plan (SRP) 3.8.4, Section I.1.F, “Other Structures,” states “In most plants, there are several miscellaneous seismic Category I structures and other structures that may be important to safety but, because of other design provisions, may not be classified as seismic Category I (e.g., radwaste building).” SRP 3.8.4, Section I.4, “Design and Analysis Procedures,” last paragraph, states “The review of the design and analysis procedures used for other structures that are important to safety (e.g., radwaste structure) are reviewed against applicable staff guidance (e.g., RG 1.143 for the radwaste structure).”

In DCD Tier 2, Section 1.2.14.4, “Compound Building,” the applicant described the compound building housing the systems and components related to radwaste management, access control and operations support center, as well as identifying this structure as seismic Category II. In addition, the compound building is considered within the scope of the design certification. Therefore, the applicant is requested to address the following, and include this information in DCD Section 3.8.4:

Applicant is requested to provide a description of the compound building; applicable codes, standards, and NRC regulatory guidance; loads and load combinations; and analysis and design approach.

Response

In DCD Tier 2, Subsection 3.8.4.1.4 will be revised to define “the description of the compound building,” as indicated in the attachment associated with this response.

The Class RW-IIa structures related to radwaste management of the compound building use ACI 349 and/or AISC N690, as applicable, in accordance with Regulatory Guide 1.143. Also, the compound building shall be designed to preclude a structural failure that results from the SSE and that degrades the structural integrity of the adjacent auxiliary building.

The design codes, standards, specifications, regulations, regulatory guides, and other industry standards for all seismic Category I structures, other than the reactor containment building, described in Section 3.8.4 will be used for analysis and design of the compound building structures.

Impact on DCD

DCD Tier 2, Subsection 3.8.4.1.4 will be revised, as indicated in the Attachment associated with this response.

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 Report.

d. Maintain the store fuel in a coolable geometry

3.8.4.1.4 Compound Building

Added.
See, next page.

3.8.4.2 Applicable Codes, Standards, and Specifications

The following design codes, standards, specifications, regulations, Regulatory Guides, and other industry standards are used in the design, fabrication, construction, testing, and inspection of all seismic Category I structures other than the reactor containment building.

3.8.4.2.1 Design Codes and Standards

The design codes, standards, and regulations are listed in Table 3.8-1.

3.8.4.2.2 Regulatory Guides

The conformance of other seismic Category I structures to the applicable NRC RGs is addressed in Section 1.9. The NRC RGs that are applicable to the design of all seismic Category I structures other than the reactor containment building are NRC RGs 1.29 (Reference 28), 1.60, 1.61, 1.69 (Reference 29), 1.91 (Reference 30), 1.92, 1.115 (Reference 31), 1.122, 1.142, 1.143 (Reference 32), and 1.199.

3.8.4.2.3 Industry Standards

Nationally recognized industry standards, such as those published by ASTM, are used where practicable to define material properties, testing procedures, and fabrication and construction methods.

3.8.4.3 Loads and Load Combinations

This section presents the structural design load information for the APR1400 seismic Category I structures other than the reactor containment building. This load information consists of a summary list of major loads and load combinations. These load combinations are categorized on the basis of their nature, the probability of occurrence of each of the individual loads, and the probability of simultaneous occurrence of these loads to form a loading combination.

3.8.4.1.4 Compound Building

The compound building is a non-safety-related seismic Category II structure with an embedment depth of approximately 12.80 m (42 ft). The compound building is separated from the auxiliary building by a 0.91 m (3 ft) gap. The top of basemat is at EL.63 ft 0 in. The exterior walls of the compound building are embedded 10.87 m (35 ft 8 in) with the finished grade at EL.98 ft 8 in. The compound building is rectangular and the major dimension is approximately 65.84 m (216 ft) long and 54.25 m (178 ft) wide, and 37.03 m (121 ft 6 in.) high.

The compound building is composed of reinforced concrete walls, columns, beams and slabs. The structural system of the compound building consists of 6 major floor slabs including the basemat and roof. The labyrinth walls that create numerous compartments utilized for the radwaste management system components are arranged on the basemat and first two floors. A bridge crane, supported below EL.139 ft 6 in on the east end of the building traverses the entire width of the crane area in the north-south direction.

The Class RW-IIa structures related to radwaste management of the compound building use ACI 349 and/or AISC N690, as applicable, in accordance with Regulatory Guide 1.143. Also, the compound building shall be designed to preclude a structural failure that results from the SSE and that degrades the structural integrity of the adjacent auxiliary building.

The design codes, standards, specifications, regulations, regulatory guides, and other industry standards for all seismic Category I structures, other than the reactor containment building, described in Section 3.8.4.2 will be used for analysis and design of the compound building structures.

Added

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

Docket No. 52-046

RAI No.:	**227-8274**
SRP Section:	**03.08.04 – Other Seismic Category I Structures**
Application Section:	**3.8.4**
Date of RAI Issue:	**09/25/2015**

Question No. 03.08.04-4

10 CFR Part 50, Appendix A, General Design Criteria (GDC) 1, 2, 4 and 5 provide the regulatory requirements for the design of seismic Category I structures. Standard Review Plan (SRP) 3.8.4, Section II.3 includes the various loads and load combinations to be considered which include dead load, live load, hydrodynamic loads resulting from LOCA and/or safety relief valve loads, earthquake loads, and floods.

In APR1400 DCD Tier 2, Section 2.4, "Hydrologic Engineering," the applicant described the types of hydrodynamic loads on the safety-related structures. In subsection 2.4.15, "Combined License Information," the applicant requires a COL applicant to provide the site-specific hydrological events in COL item 2.4(1). In Section 3.4, "Water Level (Flood) Design," the applicant described the flood loads due to design basis flood levels from external and internal events on Seismic Category I structures. In subsection 3.4.3, "Combined License Information," the applicant requires a COL applicant to provide site-specific internal and external flooding sources in COL items 3.4(2) and 3.4(3). In subsection 3.8.4.3, "Loads and Load Combinations," the applicant requires a COL applicant to identify the site-specific loads such as effects of seiches, surges, waves, and tsunamis in COL item 3.8(2). However, it is not clear whether the applicant considered all the hydrological events described in Section 2.4 and 3.4 as loading and in the load combination(s) for the seismic Category I structures in Section 3.8.4, "Design of Seismic Category I Structures," and is there enough allowable margin(s) in loading combinations to accommodate the potential flooding loads of site-specific internal and external flooding sources, including the factors of safety given in DCD Section 3.8A (Tables 3.8A-15 & -38), and Technical Report APR1400-E-S-NR-14006-P, Rev. 0, Table 4-5.

Therefore, the applicant is requested to address the following, and include this information in the DCD:

Applicant is requested to describe how the various water/flood related loads are classified (e.g., normal, severe environmental, abnormal, etc.), how they are calculated in terms of the loads used in DCD Section 3.8.4, how are they applied in the design of seismic Category I structures, and whether there is sufficient design margin(s) in the loading combinations to accommodate the potential flooding loads of site-specific internal and external flooding sources.

Response

1) The classification of effective loadings complies with code specification (ACI 349 Ch.9) and the classified effective loadings are as follows:

   - Hydrostatic load (Lh)

     Hydrostatic loads due to weight and pressure of fluids with well-defined densities and controllable maximum heights or related internal moment and forces. Refer to DCD Section 3.8.4.3.1.b.2). This load is generally not related to natural phenomena. It is calculated as a linearly distributed pressure on the external walls.

   - Soil and surcharge load (Lg) : Normal load as described in DCD Section 3.8.4.3.1.b.1)

     This load is applied up to maximum elevation of groundwater specified in DCD Tier 2 Table 2.0-1 (0.61m (2 ft) below plant grade).

   - Flooding load (Yf) : abnormal load as described in DCD Section 3.8.4.3.2.g

     This load is applied due to internal flooding generated by a postulated pipe break in abnormal extreme environmental loading condition.

   - Design flood/precipitation (H) : severe environmental load as described in DCD Section 3.8.4.3.3.b

     This load is applied up to the maximum site flood elevation which is specified in DCD Tier 2 Table 2.0-1 (0.30m (1 ft) below plant grade).

   - Probable maximum flood/precipitation (PMF/PMP) (Hs) : extreme environmental load as described in DCD Section 3.8.4.3.4.c

     This load is applied based on the maximum flood elevation which is specified in DCD Tier 2 Table 2.0-1 (0.30m (1 ft) below plant grade).

   - Hydrodynamic load in seismic loads (Es) : extreme environmental load as described in DCD Section 3.8.4.3.4.a.1)

     This load is included in SSE loads (Es), is applied based on the maximum elevation of groundwater specified in DCD Tier 2, Table 2.0-1 (0.61m (2 ft) below plant grade).

   Soil load (Lg) and hydrodynamic load in seismic loads (Es) are applied to the design. Design flood/precipitation (H) and PMF/PMP (Hs) are not governing loads in the design of APR 1400 since the load combinations including those loadings are negligibly small compare to the other load combinations.

2) The water heads are transformed into hydro static or hydrodynamic loadings as shown below.

- Hydrostatic load

  Hydrostatic loads are calculated as a linearly distributed pressure on external walls depending on the design water level (EL. 96'-8'') according to the basic equation of hydrostatics as shown in Figure 1. The design groundwater elevation for the APR1400 standard plant design is based on the EPRI ALWR URD (Utility Requirement Document) Table 1.2-6 “Envelope of ALWR Plant Site Design Parameter”. Therefore, the maximum design ground water level is determined to be 0.61m (2 feet) below the plant grade in the vicinity of the SSSc important to safety. Please see the applicant’s response to RAI 75-8023 Question No. 03.04.02-1 item a.(ii).

  $P_W = \gamma_W h$

  Where,

  γ_W = unit weight of water = 62.4pcf

- Surcharge load

  $P_{sur} = K_o q$

  Where,

  K_o = coefficient of earth pressure at rest condition

  q = static surcharge pressure

- Earth Pressure

  $P_s = K_o \gamma$h

  Where,

  $\gamma = \gamma_s$ = Soil density in saturated condition

  $\gamma = \gamma_{sub}$ = Soil density in submerged condition

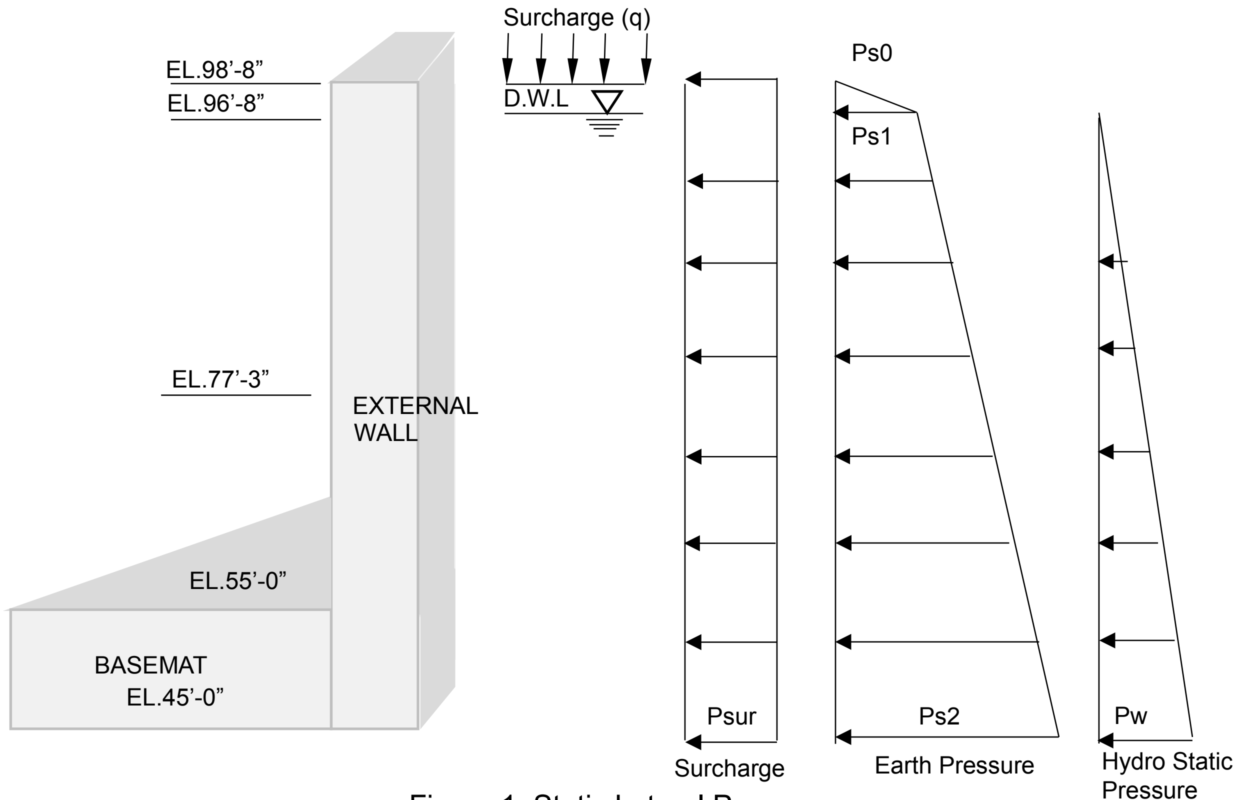

Figure 1 Static Lateral Pressure

- Dynamic groundwater pressure (Hydrodynamic water pressure)

  Dynamic groundwater pressure is calculated based on the hydro-dynamic formula suggested by Matsuo and O'Hara in "Principles of Soil Dynamics," written by Braja M. DAS. Based on the hydro-dynamic formula, the hydrodynamic water pressure due to seismic load is expressed as a parabolic distributed pressure as shown in Figure 2. The design water level (EL. 96'-8") is considered in the calculation of hydrodynamic water pressure.

  For details of dynamic groundwater pressure and dynamic earth pressure, refer to Question No.03.08.04-7 of this RAI response.

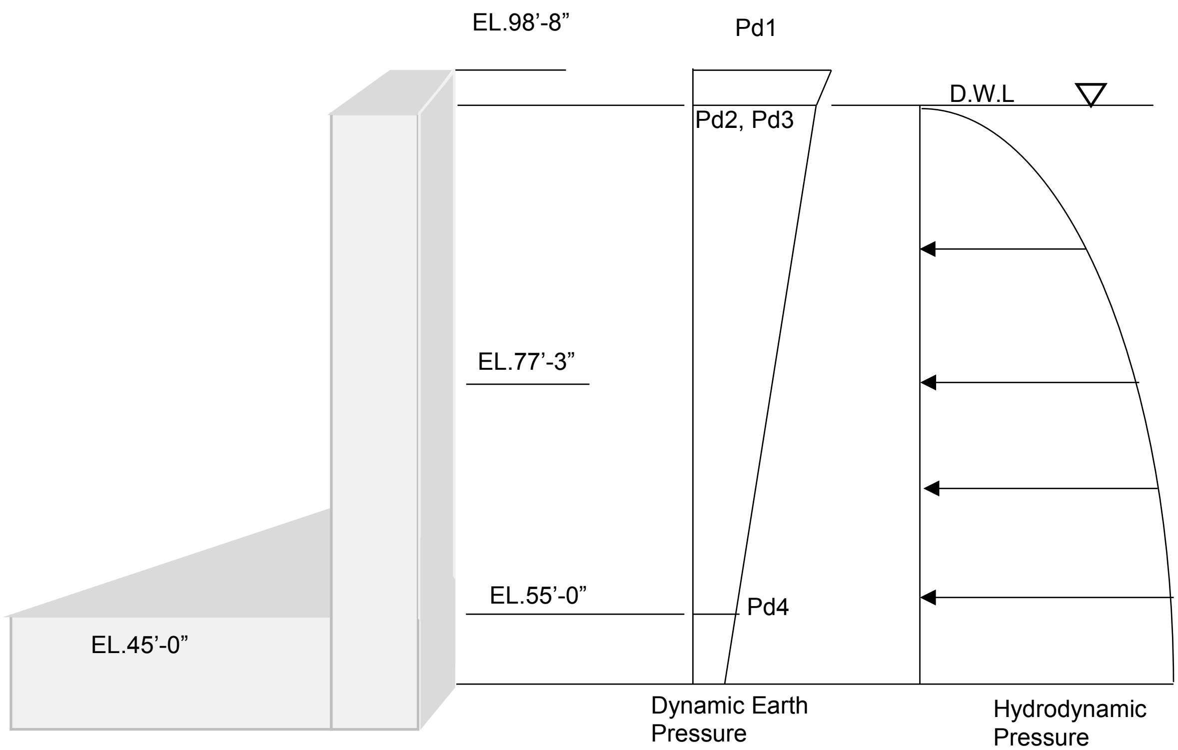

Figure 2 Dynamic Earth Pressure & Hydrodynamic Pressure

These explanations will be added to DCD subsection 3.8.4.3.7 as shown attachment 1 this response.

3) These loads were applied to the exterior walls of all seismic Category I structures and the direction of the loads were toward inside of buildings below grade, as shown in Figure 3. Therefore, Subsection 3.8.4.3.1 will be revised as shown attachment 2 this response.

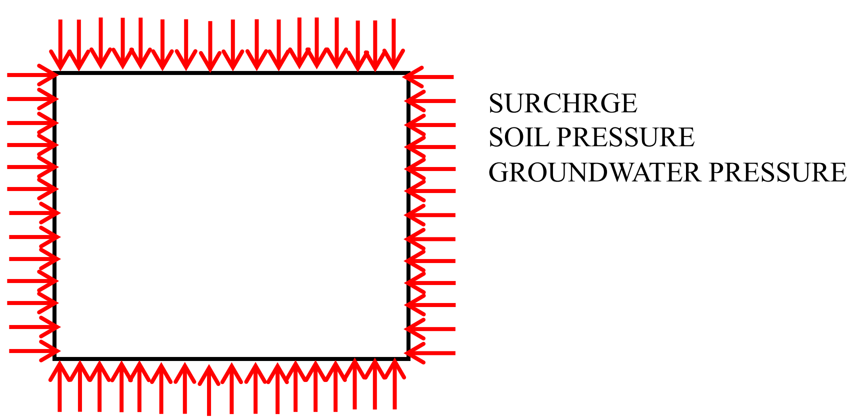

Figure 3 Schema for Lateral Earth Pressure

4) Seismic Category I structures are designed to have sufficient margins for the maximum flood load basVed on the maximum flood elevation specified in DCD Tier 2, Table 2.0-1.

Because the potential flooding loads are site-specific, a COL applicant should determine the site grade elevation with a sufficient margin to not be influenced by potential flooding loads.

Impact on DCD

DCD Subsection 3.8.4.3.1 will be revised and 3.8.4.3.7 added as indicated in the Attachments associated with this response.

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 Report.

Stresses due to seismic loads from different directions are combined by the SRSS method using the following expression:

3) Additional seismic loads due to accidental torsion

Additional seismic loads due to accidental torsion are accounted for as required by SRP Subsection 3.7.2.II.11. An additional eccentricity of the mass at each floor equivalent to 5 percent of the maximum building dimension is included. The accidental torsion load is represented by an additional shear force at each floor elevation determined from the analysis for the product of resultant story shear and accidental eccentricity at each elevation.

b. Tornado or hurricane load – (W_t)

The tornado or hurricane loads are described in Subsection 3.3.2.

c. Probable maximum flood/precipitation – (H_s)

H_s is the forces, due to the probable maximum precipitation as well as the maximum flood level, which includes the effects of seiches, surges, waves, and tsunamis.

3.8.4.3.5 <u>Other Loads</u>

Other loads are loads resulting from aircraft hazard and explosion pressure wave that are not included in the design basis. These loads are evaluated to prevent damage to safety-related structures, systems, and components beyond the design basis condition.

3.8.4.3.6 <u>Load Combinations</u>

The load combinations to be used in the design of the structure are in accordance with Tables 3.8-9A and 3.8-9B, and in conjunction with the definitions of load conditions and design loads as provided in Subsections 3.8.4.3.1 through 3.8.4.3.5.

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3.8.4.3.7 Below Grade Exterior Walls

The design and analysis procedures for seismic Category I exterior walls below grade are described below.

Hydrostatic (groundwater)

The hydrostatic unit water pressure (P_w) at a depth h below ground level is calculated as a linearly distributed pressure depending on the design water level (0.61m (2 ft) below plant grade).

$$P_W = \gamma_W h$$

Where, γ_W = unit weight of water = 62.4pcf

Static Earth Pressure

Static earth pressure is based on “at-rest” conditions and the coefficient of earth pressure is calculated as the following relationship. In addition, the soil parameters are described in DCD Table 2.0-1.

$$P_s = K_o \gamma \mathrm{h}$$

Where, $K_o = 1 - \mathrm{Sin}(\varphi)$ = Coefficient of earth pressure at rest condition

$\gamma = \gamma_s$ = Soil density in saturated condition

$\gamma = \gamma_{sub}$ = Soil density in submerged condition

Surcharge Pressures

The surcharge pressure is defined for all soil cases as the at-rest pressure as follows:

$$P_{\mathrm{sur}} = K_o \mathrm{q}$$

Where, q = static surcharge pressure

The dynamic lateral surcharge pressure is the same as the static surcharge pressure, for conservatism.

Dynamic Earth Pressures

The dynamic earth pressure is calculated in accordance with ASCE 4 (Reference 41), Section 3.5.3, Figure 3.5-1, “Variation of Normal Dynamic Soil Pressures for the Elastic Solution.”

Dynamic Groundwater Pressures

Dynamic groundwater pressure is calculated based on the hydro-dynamic formula suggested by Matsuo and O’Hara in “Principles of Soil Dynamics,” written by Braja M. DAS

(Reference 42). The design water level (0.61m (2 ft) below plant grade) is considered in the calculation of hydrodynamic water pressure.

Passive Earth Pressure

The passive earth pressure is not included in the resistance force for sliding and overturning in the basemat stability check. Therefore, passive earth pressure on exterior walls does not need to be considered.

Evaluation of the capability of a structure for a given load combination is based on providing a factor of safety appropriate to the probability of occurrence. The appropriate factor of safety is reflected in the load factors and allowable stresses for the various load combinations.

The COL applicant is to identify any applicable site-specific loads such as site proximity explosions and missiles, potential aircraft crashes, and the effects of seiches, surges, waves, and tsunamis (COL 3.8(2)).

3.8.4.3.1 Normal Loads

a. Dead loads – (D)

Dead load refers to loads that are constant in magnitude and point of application. The types and definitions of dead loads and their combination requirements are given in Table 3.8-8.

b. Live loads – (L)

Live load refers to any normal loads that may vary with intensity and location of occurrence. The types and definitions of live loads and their combination requirements are given in Table 3.8-8. The specified design values for live loads are summarized in Table 3.8-7.

1) Soil and surcharge load (L_g)

Soil and surcharge load refers to load due to weight and pressure of soil, water in soil, or other material such as soil surcharge. These loads are applied on seismic Category I structures below grade, with the force directed toward the inside of the structures. Maximum flood level is specified to be 0.30 m (1 ft) below plant grade for safety-related structures. For the construction loading condition, the minimum surcharge load is 48.0 kN/m^2 (1,000 psf) over any unoccupied area plus the actual construction loading surcharge from any known structures or load sources. For the normal loading condition, the minimum surcharge load is 24.0 kN/m^2 (500 psf). For the design of underground utilities, the minimum surcharge load for the construction loading condition is 24.0 kN/m^2 (500 psf) and for the

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

Docket No. 52-046

RAI No.:	**227-8274**
SRP Section:	**03.08.04 – Other Seismic Category I Structures**
Application Section:	**3.8.4**
Date of RAI Issue:	**09/25/2015**

Question No. 03.08.04-9

10 CFR 50.65 provides the regulatory requirements for structures monitoring and maintenance of seismic Category I structures. SRP 3.8.4, Section II.7 provides guidance on testing and inservice surveillance requirements which indicates that, for seismic Category I structures, monitoring and maintenance requirements for structures are given in 10 CFR 50.65, and RGs 1.127 and 1.160.

APR1400 DCD Tier 2, Section 3.8.4.7, "Testing and Inservice Inspection Requirements," states: "There is no testing or in-service surveillance beyond the quality control tests performed during construction, which is in accordance with ACI 349, AISC N690, or ANSI N45.2.5, in accordance with NRC RG 1.127 and NUMARC 93-01. However, the COL applicant is to monitor the safety and serviceability of seismic Category I structures during the operation of the plant, and appropriate maintenance will be provided as necessary (COL 3.8(5))." The staff notes that APR1400 DCD Tier 2, Section 3.8.4.2, "Applicable Codes, Standards and Specifications," refers to DCD Tier 2 Section 1.9, "Conformance with Regulatory Criteria," where Table 1.9-2, "APR1400 Conformance with Regulatory Guides," indicates that RGs 1.127 and 1.160 are "N/A" under the column heading "DCD Tier 2 Section." For the structures within the scope of design certification, the DCD should describe the testing and inservice inspection requirements even though they will be implemented by the COL applicant under COL 3.8(5).

Therefore, the applicant is requested to describe the testing and inservice inspection requirements including extent of compliance with 10 CFR 50.65, and RGs 1.160 and 1.127. Unless otherwise justified, these RGs are applicable to the testing and inservice inspection requirements of seismic Category I structures, and thus they should be included in the various applicable Sections of the DCD.

Response

A description of the testing and inservice inspection requirements, including complying with 10 CFR 50.65 and RGs 1.127 and 1.160, will be added to DCD Subsection 3.8.4.7 and the corresponding Combined License Information item will be revised as shown below:

“For other seismic Category I structures outside containment, the structures monitoring and maintenance requirements program is to be in accordance with 10 CFR 50.65 and RG 1.160.

The structures are monitored in accordance with Paragraph (a)(2) of 10 CFR 50.65, provided there is not significant degradation of the structures. The condition of all structures is assessed periodically. The appropriate frequency of the assessments is commensurate with the safety significance of the structures and their condition.

For water control structures, the inservice inspection program is to be in accordance with RG 1.127. Water control structures covered by this program include concrete structures, embankment structures, reservoirs, cooling water channels and canals, intake and discharge structures, and safety and performance instrumentation.

It is important to accommodate inservice inspection of critical areas. Monitoring and maintaining the condition of the other seismic Category I structures is essential for plant safety. Special design provisions (e.g., providing sufficient physical access, providing alternative means for identification of conditions in inaccessible areas that can lead to degradation, remote visual monitoring of high-radiation areas) to accommodate inservice inspection of other seismic Category I structures is provided on a case-by-case basis.

For plants with nonaggressive ground water/soil, (i.e., pH>5.5, chlorides < 500 ppm, sulfate < 1,500 ppm), an acceptable program for normally inaccessible, below-grade concrete walls and foundations is to examine the exposed portion of below-grade concrete, when excavated for any reason, for signs of degradation, and to conduct periodic site monitoring of ground water chemistry to confirm that the ground water remains non aggressive.

For plants with aggressive ground water/soil, (i.e., exceeding any of the limits noted above), an acceptable approach is to implement a surveillance program to monitor the condition of normally inaccessible, below-grade concrete for sign of degradation.

Therefore, for safety and serviceability of seismic Category I structures during the operation of the plant, the COL applicant is to provide appropriate testing and inservice inspection programs to examine the condition of normally inaccessible, below-grade concrete for signs of degradation and to conduct periodic site monitoring of ground water chemistry. Inservice inspection of the accessible portion of concrete structures is also to be performed. (COL 3.8(5)).”

Impact on DCD

DCD Tier 2, Subsection 3.8.4.7, 3.8.6, and Table 1.8-2 will be revised as indicated in the attachment associated with this response.

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 Report.

Erection tolerances, in general, are in accordance with the referenced design code. Where special tolerances that influence the erection of equipment are required, they are indicated on the design drawings.

3.8.4.6.3 Special Construction Techniques

No special construction techniques are used in the construction of other seismic Category I structures.

The corrosion protection of the auxiliary building reinforcing steel is provided by an adequate cover of high-quality concrete over the reinforcing bar. Unless the concrete is penetrated by chloride or sulfide ions, the reinforcing bar remains passive and will not corrode.

Slabs in the auxiliary building are constructed using metal deck and steel beams that support metal deck and concrete slab during construction. Steel beams are connected to shear walls or concrete beams. This method allows concrete slabs to be constructed without shorings and forms.

The COL applicant is to determine construction techniques to minimize the effects of thermal expansion and contraction due to hydration heat, which could result in cracking (COL 3.8(4)).

3.8.4.7 Testing and Inservice Inspection Requirements

There is no testing or in-service surveillance beyond the quality control tests performed during construction, which is in accordance with ACI 349, AISC N690, or ANSI N45.2.5, in accordance with NRC RG 1.127 and NUMARC 93-01.

~~However, the COL applicant is to monitor the safety and serviceability of seismic Category I structures during the operation of the plant, and appropriate maintenance will be provided as necessary (COL 3.8(5)).~~

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For other seismic Category I structures outside containment, the structures monitoring and maintenance requirements program is to be in accordance with 10 CFR 50.65 and RG 1.160.

The structures are monitored in accordance with Paragraph (a)(2) of 10 CFR 50.65, provided there is not significant degradation of the structures. The condition of all structures is assessed periodically. The appropriate frequency of the assessments is commensurate with the safety significance of the structures and their condition.

For water control structures, the inservice inspection program is to be in accordance with RG 1.127. Water control structures covered by this program include concrete structures, embankment structures, reservoirs, cooling water channels and canals, intake and discharge structures, and safety and performance instrumentation.

It is important to accommodate inservice inspection of critical areas. Monitoring and maintaining the condition of the other seismic Category I structures is essential for plant safety. Special design provisions (e.g., providing sufficient physical access, providing alternative means for identification of conditions in inaccessible areas that can lead to degradation, remote visual monitoring of high-radiation areas) to accommodate inservice inspection of other seismic Category I structures is provided on a case-by-case basis.

For plants with nonaggressive ground water/soil, (i.e., pH>5.5, chlorides < 500 ppm, sulfate < 1,500 ppm), an acceptable program for normally inaccessible, below-grade concrete walls and foundations is to examine the exposed portion of below-grade concrete, when excavated for any reason, for signs of degradation, and to conduct periodic site monitoring of ground water chemistry to confirm that the ground water remains non aggressive.

For plants with aggressive ground water/soil, (i.e., exceeding any of the limits noted above), an acceptable approach is to implement a surveillance program to monitor the condition of normally inaccessible, below-grade concrete for sign of degradation.

Therefore, for safety and serviceability of seismic Category I structures during the operation of the plant, the COL applicant is to provide appropriate testing and inservice inspection programs to examine the condition of normally inaccessible, below-grade concrete for signs of degradation and to conduct periodic site monitoring of ground water chemistry. Inservice inspection of the accessible portion of concrete structures is also to be performed.(COL 3.8(5)).

The COL applicant is to provide testing and inservice inspection programs to examine inaccessible areas of concrete structures for degradation and monitoring of groundwater chemistry (COL 3.8(9)).

The long-term settlement is the site-specific characteristics. The COL applicant is to provide the soil parameters for APR1400 site (COL. 3.8(10).

3.8.6 Combined License Information

COL 3.8(1) The COL applicant is to provide the design of site-specific seismic Category I structures such as the essential service water building and the component cooling water heat exchanger building, essential service water condits, and class 1E electrical duct runs.

COL 3.8(2) The COL applicant is to identify any applicable site-specific loads such as site proximity explosions and missiles, potential aircraft crashes, and the effects of seiches, surges, waves, and tsunamis.

COL 3.8(3) The COL applicant is to determine the environmental condition associated with the durability of concrete structures and provide the concrete mix design that prevents concrete degradation including the reactions of sulfate and other chemicals, corrosion of reinforcing bars, and influence of reactive aggregates.

COL 3.8(4) The COL applicant is to determine construction techniques to minimize the effects of thermal expansion and contraction due to hydration heat, which could result in cracking.

COL 3.8(5) ~~The COL applicant is to monitor the safety and serviceability of seismic Category I structures during the operation of the plant and provide the appropriate maintenance.~~

For safety and serviceability of seismic Category I structures during the operation of the plant, the COL applicant is to provide appropriate testing and inservice inspection programs to examine the condition of normally inaccessible, below-grade concrete for signs of degradation and to conduct periodic site monitoring of ground water chemistry. Inservice inspection of the accessible portion of concrete structures is also to be performed.

COL 3.8(6) The COL applicant is to provide reasonable assurance that the design criteria listed in Table 2.0-1 are met or exceeded.

Table 1.8-2 (4 of 29)

Item No.	Description
COL 3.7(3)	The COL applicant is to provide the seismic design of the seismic Category I SSCs that are not part of the APR1400 standard plant design. The seismic Category I structures are as follows: a. Seismic Category I essential service water building b. Seismic Category I component cooling water heat exchanger building
COL 3.7(4)	The COL applicant is to confirm that the any site-specific non-seismic Category I SSCs are designed not to degrade the function of a seismic Category I SSC to an unacceptable safety level due to their structural failure or interaction.
COL 3.7(5)	The COL applicant is to perform any site-specific seismic design for dams that is required.
COL 3.7(6)	The COL applicant is to perform seismic analysis of buried seismic Category I piping, conduits, and tunnels.
COL 3.7(7)	The COL applicant is to perform seismic analysis for the seismic Category I above-ground tanks.
COL 3.7(8)	The COL applicant that references the APR1400 design certification will determine whether essentially the same seismic response from a given earthquake is expected at each unit in a multi-unit site or each unit is to be provided with a separate set of seismic instruments.
COL 3.7(9)	The COL applicant is to confirm details of the locations of the triaxial time-history accelerograph.
COL 3.7(10)	The COL applicant is to identify the implementation milestones for the seismic instrumentation implementation program based on the discussion in Subsections 3.7.4.1 through 3.7.4.5.
COL 3.7B(1)	The COL applicant is to evaluate the HRHF response spectra.
COL 3.7B(2)	The COL applicant is to evaluate the representative items listed in Table 3.7B-2.
COL 3.8(1)	The COL applicant is to provide the design of site-specific seismic Category I structures such as the essential service water supply structure and the component cooling water heat exchanger building.
COL 3.8(2)	The COL applicant is to identify any applicable site-specific loads such as site proximity explosions and missiles, potential aircraft crashes, and the effects of seiches, surges, waves, and tsunamis.
COL 3.8(3)	The COL applicant is to determine the environmental condition associated with the durability of concrete structures and provide the concrete mix design that prevents concrete degradation including the reactions of sulfate and other chemicals, corrosion of reinforcing bars, and influence of reactive aggregates.
COL 3.8(4)	The COL applicant is to determine construction techniques to minimize the effects of thermal expansion and contraction due to hydration heat, which could result in cracking.
COL 3.8(5)	~~The COL applicant is to monitor the safety and serviceability of seismic Category I structures during the operation of the plant and provide the appropriate maintenance.~~
COL 3.8(6)	The COL applicant is to provide reasonable assurance that the design criteria listed in Table 2.0-1 are met or exceeded.

For safety and serviceability of seismic Category I structures during the operation of the plant, the COL applicant is to provide appropriate testing and inservice inspection programs to examine the condition of normally inaccessible, below-grade concrete for signs of degradation and to conduct periodic site monitoring of ground water chemistry. Inservice inspection of the accessible portion of concrete structures is also to be performed.