ArevaEPRDCPEm Resource

From: Pederson Ronda M (AREVA NP INC) [Ronda.Pederson@areva.com]
Sent: Tuesday, September 29, 2009 7:16 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); VAN NOY Mark (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 248, Ch. 3, Supplement 1
Attachments: RAI 248 Supplement 1 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 2 of the 25 questions of RAI No. 248 on August 14, 2009. The attached file, "RAI 248 Supplement 1 Response US EPR DC.pdf" provides technically correct and complete responses to 5 of the remaining 23 questions. One response, RAI 248, Question 03.08.04-7, has been deferred because a supporting FSAR change remains in progress.

The following table indicates the respective pages in the response document, "RAI 248 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 03.07.02-58	2	7
RAI 03.08.01-33	8	9
RAI 03.08.01-34	10	15
RAI 03.08.01-35	16	16
RAI 03.08.03-19	17	18

The schedule for technically correct and complete responses to the remaining 18 questions has been changed and is provided below:

Question #	Response Date
RAI 03.04.02-12	November 18, 2009
RAI 03.07.01-25	December 18, 2009
RAI 03.07.02-43	December 18, 2009
RAI 03.07.02-44	November 18, 2009
RAI 03.07.02-45	November 18, 2009
RAI 03.07.02-46	December 18, 2009
RAI 03.07.02-47	December 18, 2009
RAI 03.07.02-48	December 18, 2009
RAI 03.07.02-49	November 18, 2009
RAI 03.07.02-50	December 18, 2009
RAI 03.07.02-51	December 18, 2009
RAI 03.07.02-52	November 18, 2009
RAI 03.07.02-53	November 18, 2009
RAI 03.07.02-54	December 18, 2009
RAI 03.07.02-56	November 18, 2009
RAI 03.07.02-57	November 18, 2009
RAI 03.08.01-36	November 18, 2009

Sincerely,

Ronda Pederson
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From: Pederson Ronda M (AREVA NP INC)
Sent: Friday, August 14, 2009 5:05 PM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); VAN NOY Mark (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 248, Ch. 3

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 248 Response US EPR DC.pdf" provides technically correct and complete responses to 2 of the 25 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 248 Question 03.07.02-55.

The following table indicates the respective pages in the response document, "RAI 248 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 03.04.02-12	2	2
RAI 03.07.01-25	3	3
RAI 03.07.02-43	4	4
RAI 03.07.02-44	5	5
RAI 03.07.02-45	6	6
RAI 03.07.02-46	7	7
RAI 03.07.02-47	8	9
RAI 03.07.02-48	10	10
RAI 03.07.02-49	11	11
RAI 03.07.02-50	12	12
RAI 03.07.02-51	13	13
RAI 03.07.02-52	14	14
RAI 03.07.02-53	15	16
RAI 03.07.02-54	17	17
RAI 03.07.02-55	18	20
RAI 03.07.02-56	21	22
RAI 03.07.02-57	23	23
RAI 03.07.02-58	24	24
RAI 03.08.01-32	25	25

RAI 03.08.01-33	26	26
RAI 03.08.01-34	27	27
RAI 03.08.01-35	28	28
RAI 03.08.01-36	29	29
RAI 03.08.03-19	30	30
RAI 03.08.04-7	31	31

A complete answer is not provided for 23 of the 25 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 03.04.02-12	November 18, 2009
RAI 03.07.01-25	December 18, 2009
RAI 03.07.02-43	December 18, 2009
RAI 03.07.02-44	November 18, 2009
RAI 03.07.02-45	November 18, 2009
RAI 03.07.02-46	December 18, 2009
RAI 03.07.02-47	December 18, 2009
RAI 03.07.02-48	December 18, 2009
RAI 03.07.02-49	November 18, 2009
RAI 03.07.02-50	December 18, 2009
RAI 03.07.02-51	December 18, 2009
RAI 03.07.02-52	November 18, 2009
RAI 03.07.02-53	November 18, 2009
RAI 03.07.02-54	December 18, 2009
RAI 03.07.02-56	November 18, 2009
RAI 03.07.02-57	November 18, 2009
RAI 03.07.02-58	September 29, 2009
RAI 03.08.01-33	September 29, 2009
RAI 03.08.01-34	September 29, 2009
RAI 03.08.01-35	September 29, 2009
RAI 03.08.01-36	November 18, 2009
RAI 03.08.03-19	September 29, 2009
RAI 03.08.04-7	September 29, 2009

Sincerely,

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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Tuesday, July 14, 2009 7:50 PM
To: ZZ-DL-A-USEPR-DL
Cc: Candra, Hernando; Chakravorty, Manas; Xu, Jim; Patel, Jay; Miernicki, Michael; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 248(2934,3030,3034,3098,3099,3100), Ch. 3

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on June 18, 2009, and discussed with your staff on July 14, 2009. No changes were made to the draft RAI questions as a result of that discussion. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 842

Mail Envelope Properties (5CEC4184E98FFE49A383961FAD402D31014383FA)

Subject: Response to U.S. EPR Design Certification Application RAI No. 248, Ch. 3, Supplement 1
Sent Date: 9/29/2009 7:15:38 PM
Received Date: 9/29/2009 7:15:48 PM
From: Pederson Ronda M (AREVA NP INC)

Created By: Ronda.Pederson@areva.com

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Tracking Status: None

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MESSAGE	6287	9/29/2009 7:15:48 PM
RAI 248 Supplement 1 Response US EPR DC.pdf	197407	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Response to

Request for Additional Information No. 248, Supplement 1

7/14/2009

U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 03.04.02 - Analysis Procedures
SRP Section: 03.07.01 - Seismic Design Parameters
SRP Section: 03.07.02 - Seismic System Analysis
SRP Section: 03.08.01 - Concrete Containment
SRP Section: 03.08.03 - Concrete and Steel Internal Structures of Steel or Concrete Containments
SRP Section: 03.08.04 - Other Seismic Category I Structures

Application Section: FSAR Ch 3

QUESTIONS for Structural Engineering Branch 2 (ESBWR/ABWR Projects) (SEB2)

Question 03.07.02-58:

Follow-up to RAI Question 03.07.02-31

The response to RAI 108, Question 3.7.3-4 states that the FSAR will be revised to reflect a maximum time step no larger than one-tenth of the shortest period of importance e.g., the reciprocal of the cutoff frequency and in addition to use the acceptance criteria of Section 3.2.2.1(c) of ASCE 4-98. The applicant is requested to revise Section 3.7.2.1.1 of the FSAR so that it is consistent with the criteria to be used in revised FSAR Section 3.7.3.1.2.

Response to Question 03.07.02-58:

U.S. EPR FSAR Tier 2, Section 3.7.2, has used 0.005 second time steps in numerous calculations, which must be revised if this value is changed. U.S. EPR FSAR Tier 2, Section 3.7.3 has had limited use. The NRC requested that AREVA NP change the specification in U.S. EPR FSAR Tier 2, Section 3.7.3 to implement a 0.0025 second time step, which was done in the Response to RAI 108, Question 3.7.3-4.

In conformance with ASCE 4-98, Section 3.2.2.1(c), an analysis was performed to determine the comparative sensitivity of the 0.005 and 0.0025 second time steps. Graphical results of this comparison are shown in Figures 3.7.2-58-1 through 3.7.2-58-9. These results verify that the 0.005 second time step used in safety-related NI common-basemat structures seismic analyses in U.S. EPR FSAR Tier 2, Section 3.7.2 provide strong correlation with use of the 0.0025 second time step and does not change the response by more than 10 percent. This correlation conforms to the acceptance criteria in ASCE 4-98, Section 3.2.2.1(c) and the 0.005 second time step used in U.S. EPR FSAR Tier 2, Section 3.7.2.1.1 is demonstrated by this comparison to be adequate as used in current seismic evaluations.

Figure 3.7.2-58-1

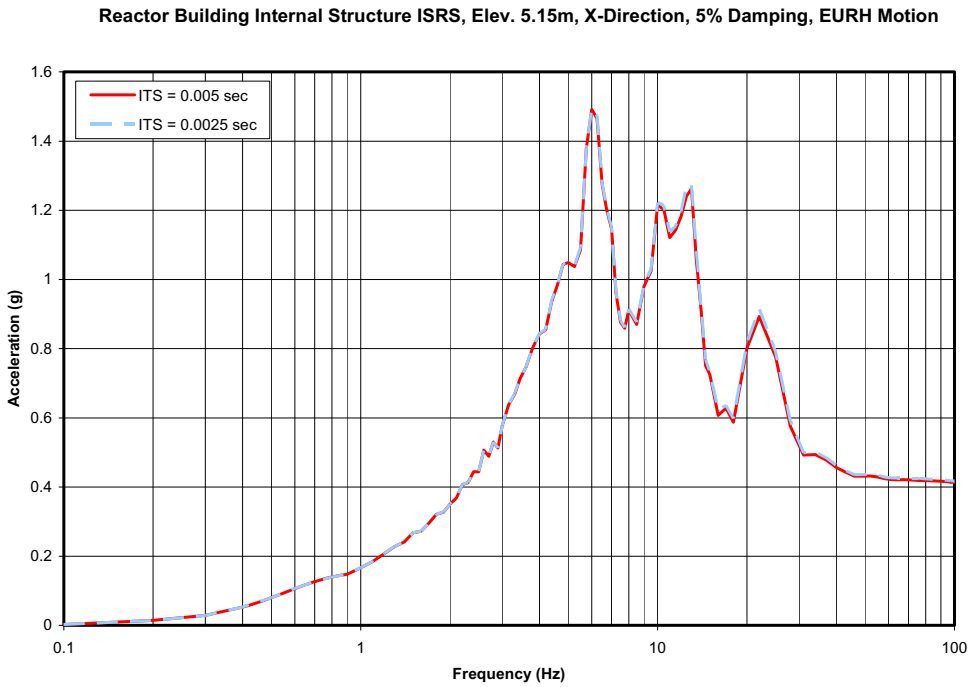


Figure 3.7.2-58-2

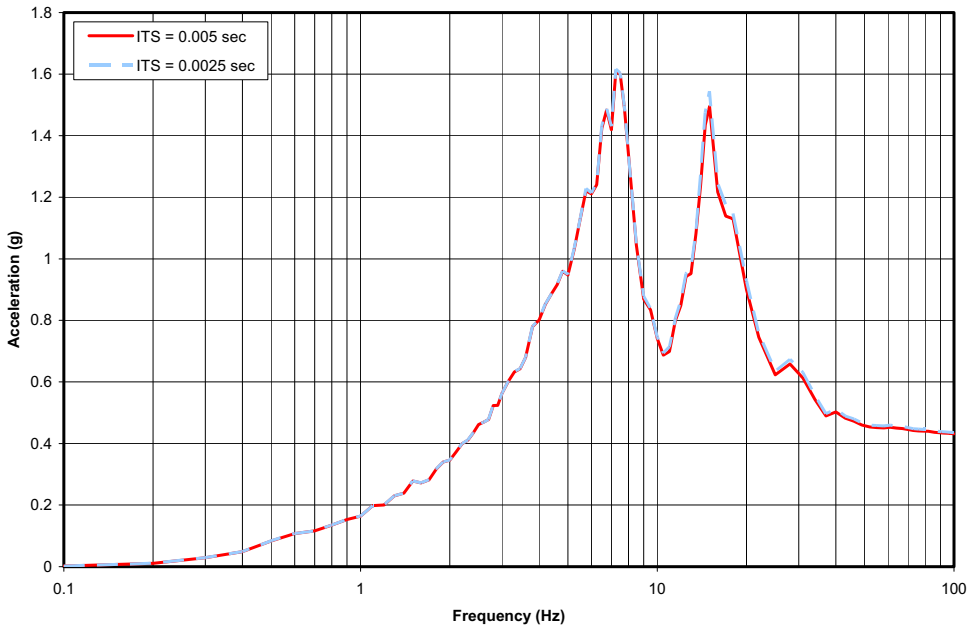


Figure 3.7.2-58-3

Reactor Building Internal Structure ISRS, Elev. 5.15m, Z-Direction, 5% Damping, EURH Motion

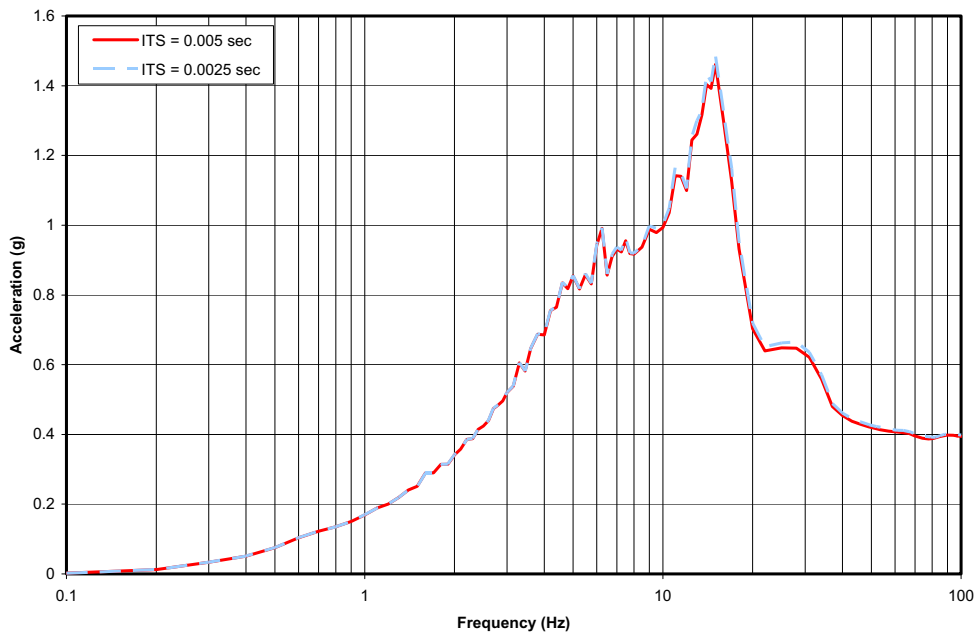


Figure 3.7.2-58-4

Safeguard Building 4 ISRS, Elev. 8.1m, X-Direction, 5% Damping, EURH Motion

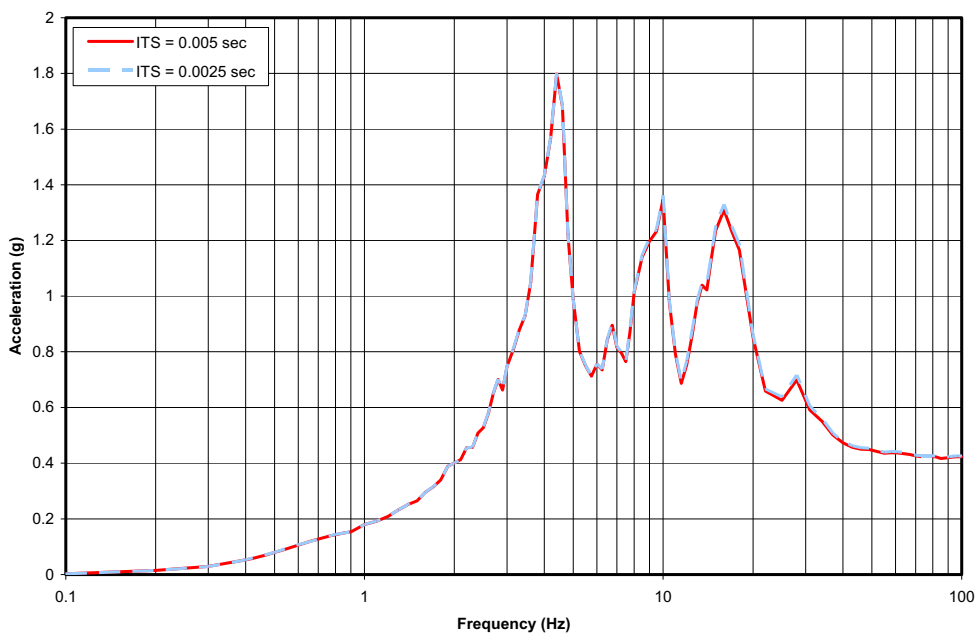


Figure 3.7.2-58-5

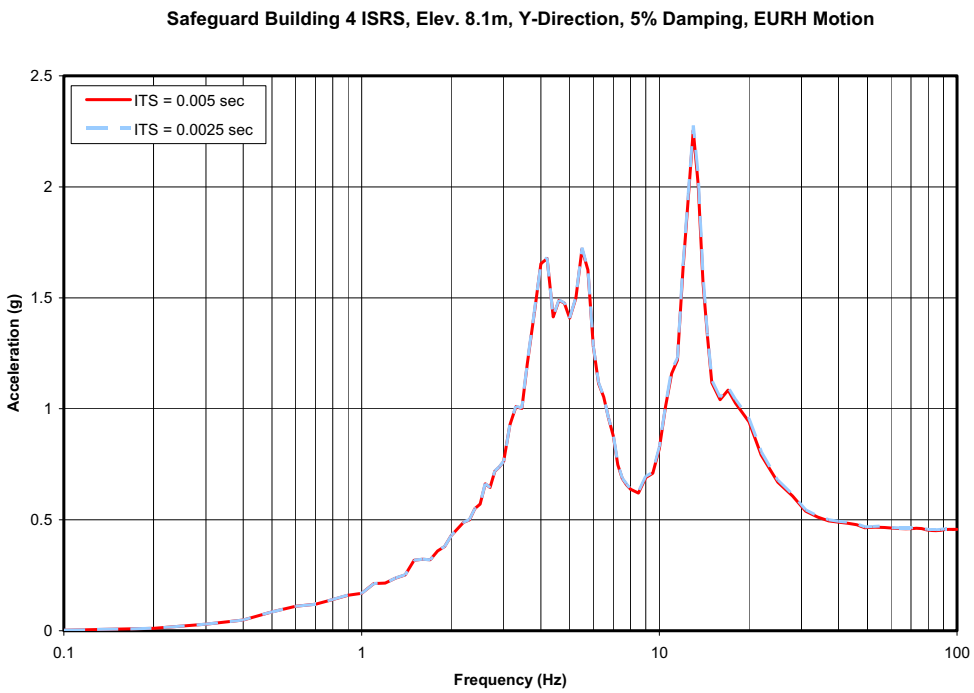


Figure 3.7.2-58-6

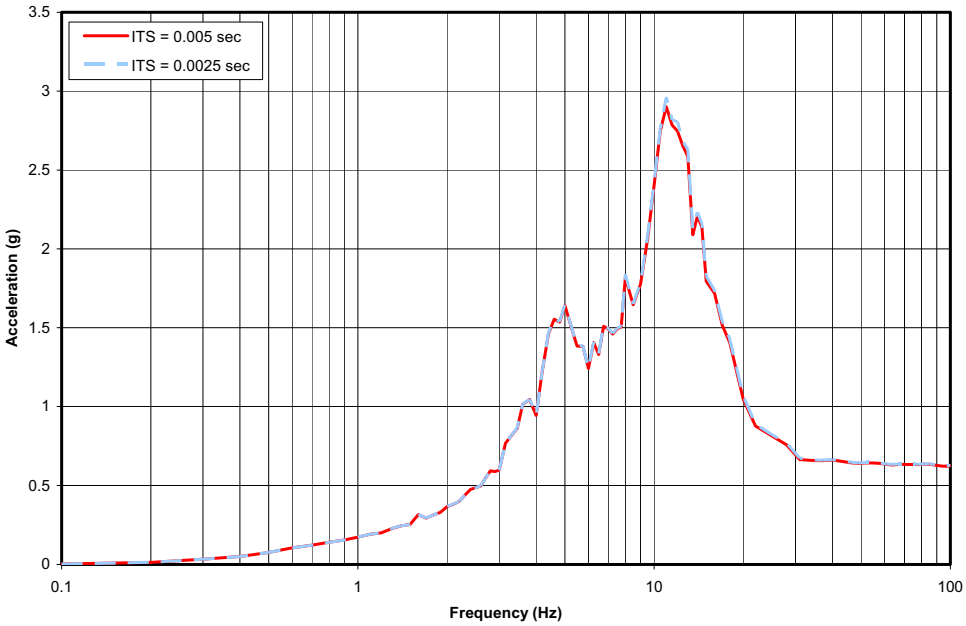


Figure 3.7.2-58-7

Safeguard Building 1 ISRS, Elev. 8.1m, X-Direction, 5% Damping, EURH Motion

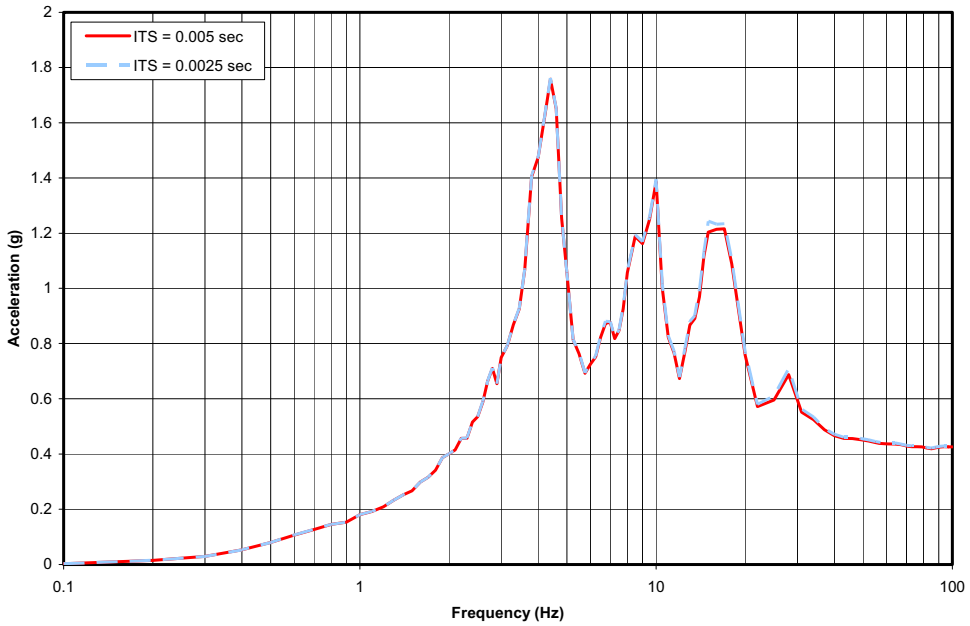


Figure 3.7.2-58-8

Safeguard Building 1 ISRS, Elev. 8.1m, Y-Direction, 5% Damping, EURH Motion

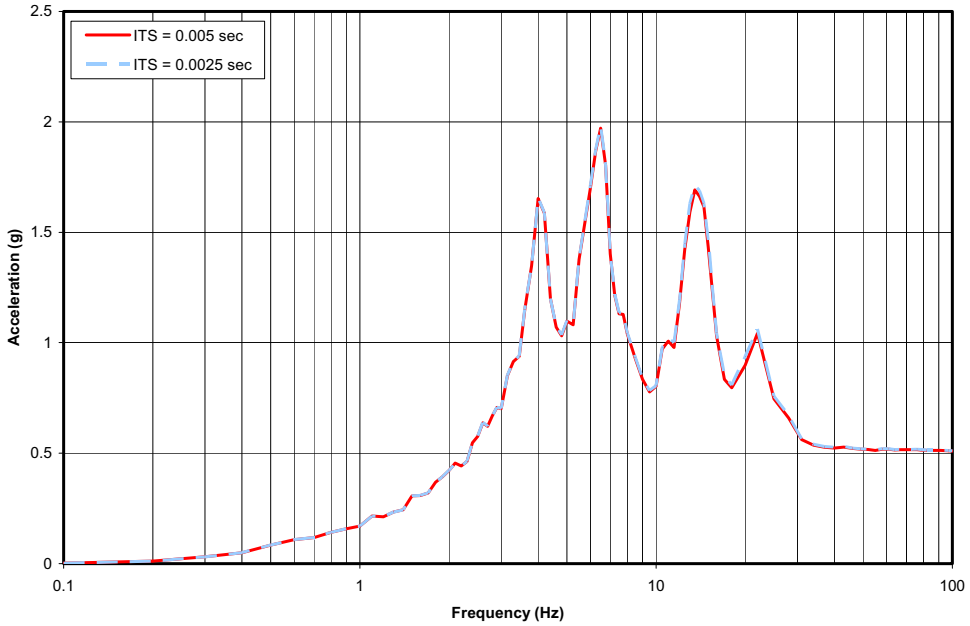
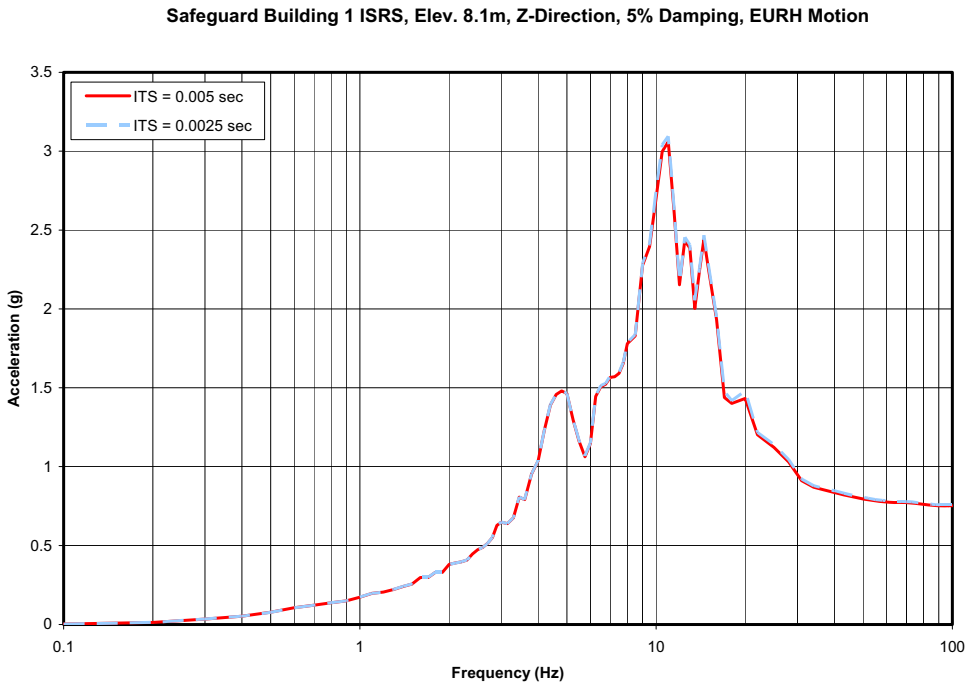


Figure 3.7.2-58-9



FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 03.08.01-33:

Follow-up to RAI Question 3.8.1-14

The applicant provided additional information to address temperature effects through the RCB wall. The following additional information is needed to resolve this RAI:

1. Provide the technical basis for stating that it is not credible that both the accidental temperature in the RCB and the minimum annulus temperature will occur at the same time. The applicant states that the response to RAI 3.8.1-16 (scheduled for submission on 5/29/09), will provide information on the effect of annulus temperature variation relative to the 79F value used to date. The staff will review this information when available to determine if it will resolve this issue.
2. Provide the technical basis for the 1000-hr steel relaxation percentage used for the determination of steel relaxation in the tendons. The staff has observed that some text book steel relaxation values show increases for temperatures above 68F much greater than the 50% assumed in the RAI response (Reference: Figure 2-15 in "Modern Prestressed Concrete" by James R. Libby, 4th Edition, Van Nostrand Reinhold, 1990).
3. With regard to Figure 3.8.1-14, provided with the RAI response, clarify the location of the vertical/gamma and hoop tendons and the magnitude of the temperatures reported in the discussion related to this figure at the tendon locations.

Response to Question 03.08.01-33:

1. A study has been performed that shows that variation in thermal properties, mechanical properties, and annulus temperatures has an insignificant effect on the forces and moments that affect the Reactor Containment Building (RCB) wall. This study is available for NRC inspection at AREVA NP offices.

   After reviewing the post-tensioning calculation and "Modern Prestressed Concrete" by James R. Libby, the steel relaxation value for a temperature of 68°F was increased by 150 percent instead of 50 percent originally reported. This produces a 1000-hr steel relaxation value of (1.7 percent)*(2.5) = 4.25 percent at 117.5°F, which is considered in the design.

   The modification of steel relaxation percentages discussed herein will be incorporated in the critical section calculations in the Response to RAI 155, Question 03.08.04-6.

2. Figure 3.8.1-14 provided in the Response to RAI 155, Question 3.8.1-14, shows that the vertical/gamma tendons are located approximately 0.525 meters from the interior face of the RCB wall to the center of the tendons, and in one year, the tendon temperature following a loss of coolant accident (LOCA) is approximately 44°C (111°F). The hoop tendons are located approximately 0.75 meters and 1.05 meters from the interior face of the RCB wall to the center of the tendons, and in one year, the average tendon temperature following a LOCA is approximately (41°C + 38°C)/2 = 39.5°C (103°F).

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 03.08.01-34:

Follow-up to RAI Question 3.8.1-15

The applicant provided additional information about the creep and shrinkage values used for the design of the pre-stressed concrete containment. The following additional information is needed to resolve this RAI:

1. It is stated that the pre-stress losses in EPR FSAR Table 3.8-5 were compared to losses for several operating U.S. plants and were found to be comparable. Provide or make available for audit, a summary of the comparisons that were made to support this conclusion.
2. Confirm that the Construction Specification will include the requirement to perform physical property tests in accordance with CC-2231.5 of the ASME Code.
3. With regard to Table 3.8.1-15 provided with the RAI response, explain why the creep coefficients for the cylinder and dome tendons are different for both T=0 and T=60 years. Also explain why the creep coefficient for the cylinder tendons at T=60 is the same as the creep coefficient for the dome tendons at T=0. Identify the text books referenced in Table 3.8.1.5 and relevant pages used to select the creep and shrinkage values reported in the table and make this information available for audit.

Response to Question 03.08.01-34:

1. The calculated tendon losses for the U.S. EPR containment building are shown in U.S. EPR FSAR Tier 2, Table 3.8-5. To ensure that these values are reasonable, the tendon losses are compared to data from several existing containment building post-tensioning calculations. Comparisons are made between prestress losses for the containment buildings of the U.S. EPR and three other nuclear power plant containment buildings, referred to as Plant 1, Plant 2, and Plant 3. The following information is taken from AREVA NP documents, which are available for NRC inspection at AREVA NP offices.

   Losses due to friction:

   The friction loss coefficients used for the calculation of prestress losses are taken from EPR-specific tests, which are available for inspection at AREVA NP offices. A direct comparison to other available data from existing U.S. plants is not conducted because they do not use the same post-tensioning system.

   Losses due to elastic shortening:

   The elastic shortening losses for the containment structures of the three existing plants and the U.S. EPR are shown in Table 03.08.01-34.1-1 (shown in terms of percentage of tendon stress at lock off). From a review of Table 03.08.01-34.1-1, it is concluded that the calculated elastic shortening losses for the U.S. EPR containment building compares well with the existing data and, thus, are reasonable.

   Losses due to creep:

The creep losses for the containment structures of the three existing plants and the U.S. EPR are shown in Table 03.08.01-34.1-2 (shown in terms of percentage of tendon stress at lock off). The creep losses shown for Plants 1, 2, and 3 are for a life span of 40 years, while the creep losses shown for the U.S. EPR are for a life span of 60 years. From a review of Table 03.08.01-34.1-2 it is concluded that creep losses for the vertical tendons compare well with the existing data. However, larger creep losses occur for the hoop and dome/gamma tendons of the U.S. EPR than what is delineated for the respective tendons of the other U.S. plants. Consideration is given to the difference in the design life of Plants 1, 2, and 3 (40 years) and the U.S. EPR (60 years). Additionally, the values for creep loss for the hoop and dome/gamma tendons of the U.S. EPR are larger (i.e., conservative) than those of the other U.S. plants. Therefore, the creep loss values for the hoop and dome/gamma tendons of the U.S. EPR are appropriate for design.

Loss due to shrinkage:

The shrinkage losses for the containment structures of two of the three existing plants and the U.S. EPR are shown in Table 03.08.01-34.1-3 (shown in terms of percentage of tendon stress at lock off). Shrinkage losses were not available for Plant 3. The shrinkage losses shown for Plants 1 and 2 are for a life span of 40 years, while the shrinkage losses shown for the U.S. EPR are for a life span of 60 years. From a review of Table 03.08.01-34.1-3, it is concluded that larger shrinkage losses occur for the tendons of the U.S. EPR than what is delineated for those tendons of Plants 1 and 2. Consideration is given to the difference in the design life of Plants 1 and 2 (40 years) and the U.S. EPR (60 years). Additionally, the values for shrinkage loss for the tendons of the U.S. EPR are larger (i.e., conservative) than that of Plant 1 and 2. Therefore, the shrinkage losses for the tendons of the U.S. EPR are appropriate for design.

Loss due to steel relaxation:

The steel relaxation losses calculated for the U.S. EPR containment building are determined using an approximate value for ρ_{1000} (the steel relaxation at a test age of 1000 hours). The value used for ρ_{1000} was based on recent results of 1000-hour relaxation tests of the same tendon material for the U.S. EPR containment post-tensioning system, as well as ASTM minimum requirements. A direct comparison to the three existing plants is not conducted because these plants use different tendon material and due to changes in manufacturing techniques, which has resulted in tendon wire which tends to exhibit less relaxation. The steel relaxation losses calculated for the containment building of the U.S. EPR are reasonable because they are based on recent test data for similar tendon material.

2. The Construction Specification will include the requirement to perform physical property tests in accordance with subparagraph CC-2231.5 of the ASME Boiler and Pressure Vessel Code.

3. The creep and shrinkage values presented in the Response to Question 03.08.01-15 are based on equations/information taken from “Reinforced Concrete: Mechanics and Design” by James G. MacGregor, published by Prentice Hall, 1988 (pp 61-68). The eight page excerpt from “Reinforced Concrete: Mechanics and Design” is included as an attachment to an AREVA NP calculation and is available for NRC inspection at AREVA NP offices.

The value for ultimate shrinkage strain at T = ∞ (ε_{shu}) is taken from "Reinforced Concrete: Mechanics and Design," page 63.

Creep coefficients for the cylinder and dome tendons (referred to herein as creep coefficients for the cylinder and dome concrete) are calculated for both T=0 and T=60, using equation (3-20) of "Reinforced Concrete: Mechanics and Design," as

$$\varphi(t_e,t_0) = 0.4 + \varphi_f\, \alpha_{sc}\, [\beta_c(t_e) - \beta_c(t_0)]$$

where:

φ_f = the basic creep coefficient for the anticipated concrete composition and relative humidity,

α_{sc} = the correction factor for size effects (this is a function of the effective thickness), and

$\beta_c(t_e)$ and $\beta_c(t_0)$ = fractions of the final creep that have occurred at effective ages t_e and t_0, respectively.

Although the above equation gives the creep coefficient for plain concrete, "Reinforced Concrete: Mechanics and Design" states:

"In concrete containing reinforcement, the creep strains lead to a redistribution of stress between the concrete and the steel, which generally acts to reduce the stress in the concrete, which in turn, leads to less total strain than would be anticipated for plain concrete."

In the calculation for prestress losses, φ_f is equal in value for the cylinder and dome concrete for both T=0 and T=60. The value of φ_f is a function of the relative humidity, which remains constant throughout the calculation, and three factors (that allow adjustments in slump, fines, and air content of the concrete), which can be considered equal to 1.0 if details of the concrete composition are not known. The value for the three factors is considered equal to 1.0, because specific details of the U.S. EPR RCB concrete mix design are not available.

In the calculation for prestress losses, α_{sc} is equal in value for the cylinder and dome concrete for both T=0 and T=60 because cylinder and dome walls are effectively thick enough that α_{sc} reaches a constant value (as shown in Figure 3-21(a) of "Reinforced Concrete: Mechanics and Design").

Therefore, the term $[\beta_c(t_e) - \beta_c(t_0)]$ is what causes the creep coefficient to vary. The values for β_c are a function of:

- t_0 – the effective age of the concrete when post-tensioning is applied, and
- t_e – the effective age of the concrete at either the start of plant operations (T=0), or
- the end of plant operations (T=60).

The values for β_c are taken from Figure 3-21(b) of "Reinforced Concrete: Mechanics and Design."

At the time of post-tensioning, the cylinder concrete will have an age greater than that of the dome concrete. Thus, the value for $\beta_c(t_0)$ will be different for the cylinder and dome concrete. This result in the following two $\beta_c(t_0)$ values:

(A) $\beta_c(t_0)$ for the cylinder concrete.
(B) $\beta_c(t_0)$ for the dome concrete.

The difference in age between the cylinder and dome concrete will still be present at the start of plant operations (T=0) and end of plant operations (T=60). This means that there will be four different values for the effective age of concrete, which results in four different values for $\beta_c(t_e)$:

(C) $\beta_c(t_e)$ for the cylinder concrete at T=0.
(D) $\beta_c(t_e)$ for the dome concrete at T=0.
(E) $\beta_c(t_e)$ for the cylinder concrete at T=60.
(F) $\beta_c(t_e)$ for the dome concrete at T=60.

At T=0, the creep coefficient for the cylinder and dome concrete are different due to the difference in concrete age. That is to say, $[\beta_c(t_e) - \beta_c(t_0)]$ for the cylinder concrete does not equal $[\beta_c(t_e) - \beta_c(t_0)]$ for the dome concrete. For the cylinder concrete at T=0, this can be illustrated as:

$[\beta_c(t_e) - \beta_c(t_0)]$ = Item (C) – Item (A)

and for the dome concrete at T=0 as:

$[\beta_c(t_e) - \beta_c(t_0)]$ = Item (D) – Item (B)

The same is true for the cylinder and dome concrete at T=60. For the cylinder concrete at T=60, this can be illustrated as:

$[\beta_c(t_e) - \beta_c(t_0)]$ = Item (E) – Item (A)

and for the dome concrete at T=60 as:

$[\beta_c(t_e) - \beta_c(t_0)]$ = Item (F) – Item (B)

For the cylinder concrete at T=60 and the dome concrete at T=0, the $[\beta_c(t_e) - \beta_c(t_0)]$ term is identical in value. This causes the creep coefficients for both to be equal in value. This occurs by coincidence; there is no relationship between the two creep coefficients.

Table 03.08.01-34.1-1—Comparison of Elastic Shortening Losses

Plant Name	Elastic Shortening Loss(1)		
	Hoop Tendons	Vertical Tendons	Dome/Gamma Tendons
Plant 1	1.4	0.8	1.5
Plant 2	2.7	0.9	2.4
Plant 3	7.8	3.3	7.5
Average of Plant 1, 2, and 3	4.0	1.7	3.8
US EPR	3.5	1.7	2.5

Table 03.08.01-34.1-2—Comparison of Creep Losses

Plant Name	Creep Loss(1)		
	Hoop Tendons	Vertical Tendons	Dome/Gamma Tendons
Plant 1	2.1	1.3	2.3
Plant 2	7.4	7.4	8.4
Plant 3	9.7	9.7	9.7
Average of Plant 1, 2, and 3	6.4	6.1	6.8
US EPR	10.8	6.0	10.0

Table 03.08.01-34.1-3—Comparison of Shrinkage Losses

Plant Name	Shrinkage Loss(1)		
	Hoop Tendons	Vertical Tendons	Dome/Gamma Tendons
Plant 1	1.5	1.5	1.5
Plant 2	2.2	2.2	2.2
Plant 3	Not Available	Not Available	Not Available
Average of Plant 1 and 2	1.9	1.9	1.9
US EPR	5.7	5.7	6.0

Note:

1. In terms of percentage of tendon lock off stress

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 03.08.01-35:

Follow-up to RAI Question 3.8.1-18

The applicant provided additional information about the tendon ducts used for the design of the pre-stressed concrete containment. The following additional information is needed to resolve this RAI:

1. The response states that one variation of the Freyssinet C-range post-tensioning system includes an additional polyurethane sheathing around each seven-wire strand. Explain how this coating meets the requirements of CC-2442.3 Permanent Coatings of the ASME Code. Also explain if any bonding between the tendon and surrounding grout has been assumed in the design. If so, how does the presence of the polyurethane sheathing affect these bonding assumptions?
2. Clarify how the grouting process ensures that there will be no void spaces in the corrugated steel tendon ductwork.

Response to Question 03.08.01-35:

1. The Freyssinet C-Range Post-tensioning System N°2 uses sheathed and greased strands. The sheath is composed of high-density polyethylene (HDPE), not polyurethane as previously stated. Manufacturer's experience has shown that this HDPE sheath is inert within the post-tensioning system. If System N°2 is used for the U.S. EPR Reactor Containment Building (RCB), the grease will meet CC-2442.3 Permanent Coatings of the ASME Code requirements. Bonding between the tendon and surrounding grout is not assumed in RCB design.

2. Corrugated steel ducts have been used extensively in post-tensioned concrete construction. With proper materials, details, equipment, and procedures (items to be provided by the manufacturer), grouting can typically be completed with 100 percent filling using conventional techniques. In addition, inspection ports can be provided at locations where the potential is high for voids to exist. For special cases, the manufacturer may recommend an alternative grouting procedure to achieve 100 percent filling of the tendon ducts.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 03.08.03-19:

Follow-up to RAI Question 3.8.3-7

The applicant's response indicates that there are two removable panels at Elevation 93 feet, 6 inches enclosing the inside face of the Steam Generator enclosures as shown in U.S. EPR FSAR Tier 2, Figure 3B-11. The response further states that the stiffness and mass of these panels was accounted for in the dynamic model with an appropriate pinned boundary condition. The following additional information is needed to resolve this RAI:

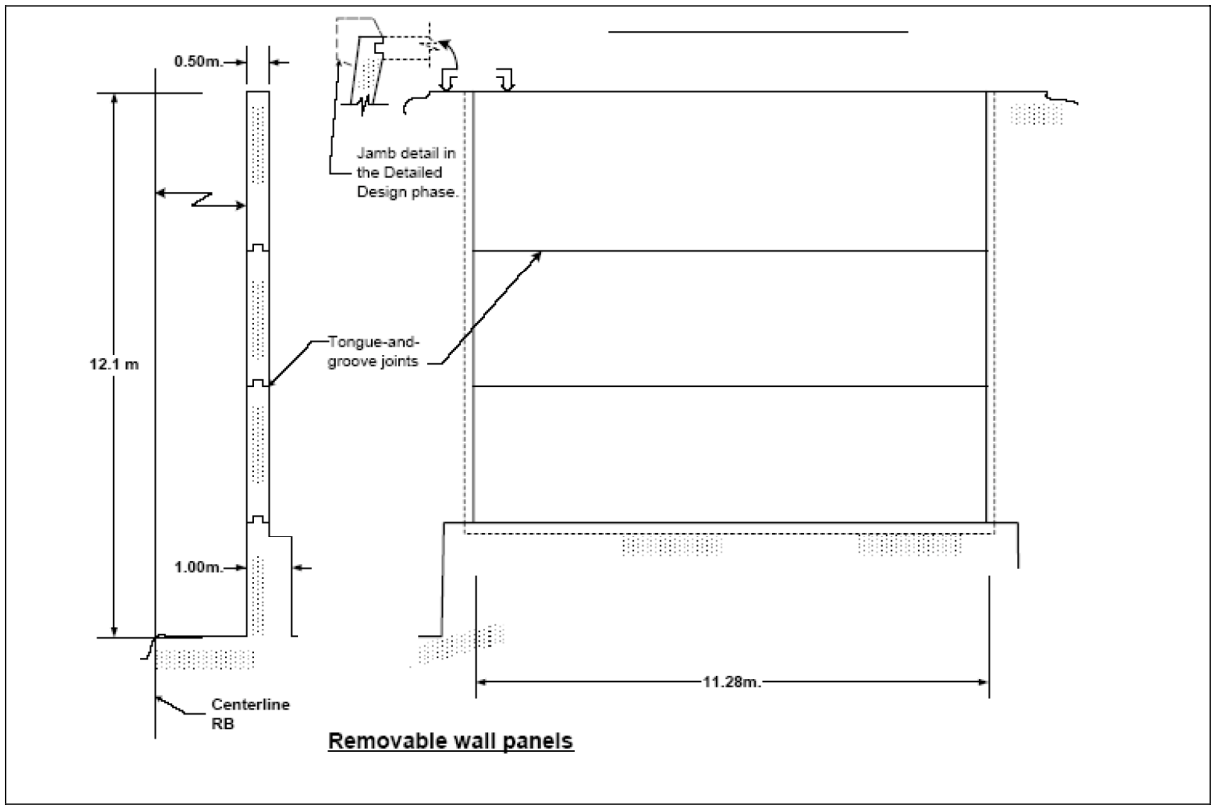
1. Explain where these panels are shown in FSAR Figure 3B-11 and provide a clearer figure illustrating the structural configuration of these panels and how they are keyed into SG cubicles.
2. Explain how the stiffness and mass of these panels were accounted for in the dynamic model. Are the panels specifically modeled in the FEM model with pinned boundary conditions?

Response to Question 03.08.03-19:

1. The removable panels are shown in U.S. EPR FSAR Tier 2, Figure 3B-11. These panels are 0.50 m thick running north-south. Figure 3.8.3-19-1 shows the general location plan and structural configuration. U.S. EPR FSAR Tier 2, Section 3.8.3.1.2 describes the function.

2. Panel mass and stiffness is specifically modeled in the FEM dynamic model using pinned boundary conditions. These removable panels are non-structural-load resisting elements.

Figure 3.8.3-19-1—Removable Panels



FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.