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Your ref: Docket No. 52-006
Our ref: DCP_NRC_002811

March 5, 2010

Subject: AP1000 Response to Request for Additional Information (SRP 3)

Westinghouse is submitting a response to the NRC request for additional information (RAI) on SRP Section 3. This RAI response is submitted in support of the AP1000 Design Certification Amendment Application (Docket No. 52-006). The information included in this response is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

Enclosure 1 provides the response for the following RAI(s):

RAI-SRP3.8.4-SEB1-03 R1

Questions or requests for additional information related to the content and preparation of this response should be directed to Westinghouse. Please send copies of such questions or requests to the prospective applicants for combined licenses referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Robert Sisk'.

Robert Sisk, Manager
Licensing and Customer Interface
Regulatory Affairs and Standardization

/Enclosure

1. Response to Request for Additional Information on SRP Section 3

cc: D. Jaffe - U.S. NRC 1E
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ENCLOSURE 1

Response to Request for Additional Information on SRP Section 3

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Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP3.8.4-SEB1-03

Revision: 1

Question:

DCD Rev. 16, Section 3.8.4.4.1 describes the design and analysis procedures of seismic category I structures outside of containment. Several revisions were made in this section some of which are Tier 2* changes. Westinghouse is requested to explain why these revisions in DCD Section 3.8.4.4.1 have been made and to explain or demonstrate the design adequacy of these changes.

DCD Section 3.8.4.4.1 describes the model of the shield building roof and passive containment cooling water storage tank. This DCD section indicates that the model is shown in Figure 3.8.4-3; however, the DCD revision for this figure states that "Figure 3.8.4-3 not used." The staff notes that a cross sectional view showing structural details of the shield building roof and passive containment cooling water storage tank is shown in Figure 3.8.4-2.

Westinghouse is requested to explain why the comparable figure showing the finite element model of this structure was removed.

Appendix 3H, which describes the auxiliary and shield building critical sections, has removed in numerous locations the results of the structural analyses (e.g., DCD Table 3.H.5-2 which previously provided the governing load combinations and required reinforcement) and removed several figures (e.g., Figure 3H.5-11 showing design details of the shield building roof). Westinghouse is requested to explain why these results and figures were removed while the results and figures for other seismic Category I structures remain in the DCD. Much of this information was identified as Tier 2* in the prior revision of the DCD.

Please provide the date at which the following Westinghouse reports will be revised to include the resolution of related RAIs: APP-GW-GLR-027 (Technical Report TR45), APP-GW-GLR-045 (Technical Report TR57), APP-GW-GLN-105 (Technical Report TR105) and APP-GW-GLN-112 (Technical Report TR112). If no revision is planned, so state.

Additional Question: (Revision 1)

Revisions made in DCD Section 3.8.4.4.1: why made and demonstrate adequacy; results of structural analyses removed from DCD (e.g., member forces) which were previously Tier 2*. Based on W/NRC/BNL conference call on 5/12/09, it was indicated that "Westinghouse will provide a revised RAI response to address this item."

DCD Rev. 16, App. 3H has removed, in numerous locations, the results of the structural analyses. For example, Table 3.H.5-2 previously provided the forces for the governing load

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combinations and Table 3.H.5-5 provided required reinforcement. These tables were removed from the DCD in DCD Rev. 16. Overall, DCD App. 3H should provide, as it did in the prior certified design, the design summary of the Auxiliary and Shield Bldg critical sections. That is why the staff identified the entire App. 3H as Tier 2* in the previous certified design. Therefore, the staff requests that the same or comparable information should be provided for the updated DCD for all applicable critical sections.

We note that in the 5/4/09 letter response to this RAI, WEC referred to their TR-57, Rev. 1, for the analysis and design of the critical sections for the enhanced shield building. This TR-57 is being reviewed separately by NRC staff and is still unresolved/open at this time. Also, from the title of TR-57, it should also cover the auxiliary bldg. in addition to the shield bldg. So this RAI will remain unresolved until TR-57 review is complete and the appropriate analysis and design information from TR-57 for both the shield bldg. and the auxiliary bldg. are included in the DCD, in a manner comparable to what was done in the previous certified DCD.

Westinghouse Response:

The changes were made to Section 3.8.4.4.1 to address the enhanced shield building design features. The enhanced shield building design does not use the T-headed anchors at the end of the shear stirrups which was shown in DCD Revision 15. Therefore, the text in the first bullet of DCD Section 3.8.4.4.1 was updated. The description in the fifth bullet was also updated based on the design of the new air inlets.

The changes to Section 3.8.4.4.1 to address the 'enhanced shield building design' features were communicated to the NRC in Technical Report APP-GW-GLR-045, Revision 1.

- The purpose of APP-GW-GLR-045, Revision 1 (submitted to the NRC with DCP/NRC2047 dated November 21, 2007) was to update critical sections design and analysis to conform to the revised seismic analysis report, APP-GW-S2R-010 (TR03), Revision 1, "Extension of Nuclear Island Seismic Analysis to Soil Sites" dated September 2007.
- The APP-GW-GLR-045, Revision 1 contained both the changes that were included in Revision 16 of the DCD and the proposed changes to Revision 16 of the DCD. (Note: The proposed changes to Revision 16 were later incorporated in a DCD Revision 17.
- The critical sections associated with the shield building roof that were included Revision 0 of APP-GW-GLR-045 were not included in Revision 1 of APP-GW-GLR-045. These sections required additional analysis and design details relevant to the design changes that were required in support of the Shield Building Design Enhancement, and were not completed when Revision 1 was published. Revision 2 of APP-GW-GLR-045 included design details relevant to the design changes that were required in support of the Shield Building Design

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Enhancement. (Note: APP GW GLR 045 was updated to Revision 2; and transmitted with letter DCP/NRC2188, dated July 1, 2008).

In DCD Revision 15, Figure 3.8.4-3 showed the finite element model of the details of the Tension Ring, the Air Inlet and the air inlet columns. Due to design changes associated the enhanced shield building design, the details shown in DCD Revision 15, Figure 3.8.4-3 are no longer correct. Figure 3.8.4-3 is no longer referenced in DCD Section 3.8.4.4.1, Revision 17. Design information for the enhanced shield building design is included in DCD Revision 17 section 3H.5.6, in Table 3H.5-9, and in Figures 3H.5-11.

The detailed finite element analysis model for the shield building roof and passive containment cooling water storage tank is contained in a Westinghouse calculation and has a level of detail not appropriate for inclusion in the DCD. This information is available for NRC review and audit. It was presented to the NRC review staff during an October 2008 meeting.

The changes in DCD Appendix 3H to remove results of the structural analyses (the calculated results for load combinations and required reinforcement) were communicated to the NRC in Technical Report APP-GW-GLR-045 (TR57) Revision 1, Chapter 5.0 "DCD Mark Up" (November 2007). APP-GW-GLR-045, Revision 1 also identified the removal of the design load summary tables of member forces and moments in Appendix 3H.

The information removed from tables in the DCD represents the results of detailed calculations and analyses. These results change slightly during the design finalization due to changes related to constructability and construction sequence. Finalization of the design spectra can also result in minor changes in the as-designed results. The DCD changes between Revision 15 and Revision 16 also supported the change of the design spectra from a hard rock only case to design spectra acceptable for multiple rock and soil cases. Small changes in modeling and updates to software may also have a minor effect on the results. For these reasons it is not practical to lock in the design and analysis results in the DCD.

DCD Subsections 3.8.3, 3.8.4, and Appendix 3H provide information on the criteria, design configuration, and concrete reinforcement. Information on design of the critical sections of the shield building is included in DCD Revision 17. These requirements and criteria lock-in the design for NRC review and demonstrate to the NRC that the requirements and criteria for the design conforms with review guidance or otherwise uses appropriate design and analysis methods. The level of detail represented by the design summary tables of forces and moments does not appear to be consistent with the guidance of Regulatory Guide 1.70 and Standard Review Plan Section 3.8.4. SRP Section 3.8.3 and 3.8.4 do not suggest that this detailed information should be included in the DCD. Attempting to lock in the design loads results overspecifies the design. The design loads and related information removed in DCD Revision 16 included the amount of reinforcement provided and identified the fraction of the limit calculated. This overly restricts the changes to the design during design finalization.

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Detailed results of the analyses of the critical structures and other structures are available for NRC audit and have been reviewed by NRC review staff. One of the reasons that the specific results for the critical structures were included in the DCD through Revision 15 was because of the relatively limited amount of design information available for the NRC review staff to look at to make a judgment about the implementation of the design methods, requirements, and criteria in the structural design. The information now available for the shield building for NRC review is much more complete and comprehensive.

Technical reports APP-GW-GLR-027, APP-GW-GLR-045, APP-GW-GLN-105, and APP-GW-GLN-112 were prepared to support the preapplication review of completion of COL information items and changes to the certified design. The Design Certification amendment application was submitted in May 2007 and changes have been incorporated into DCD Revisions 16 and 17. Also, RAI responses are included in the Design Certification amendment docket. So, there is little utility in revising technical reports to incorporate RAI responses. Westinghouse does not plan to make additional revision to these technical reports. Please note that APP-GW-GLR-045 was updated to Revision 2 and transmitted with letter DCP/NRC2188, dated July 1, 2008

Westinghouse Additional Response: (Revision 1)

This response addresses the tables that are contained in the DCD Appendix 3H.

Tables that were removed in DCD Revision 16 are replaced in DCD Revision 18. Technical Report APP-GW-GLR-045 (TR-57), Revision 2, was submitted to the NRC July 1, 2008 via letter DCP/NRC2188. The forces and moments in critical locations that are being restored in the DCD are taken from this report.

Table 3H.5-9, "Shield Building Roof Reinforcement Summary," will be updated based on the shield building design modifications reported to the NRC.

Design Control Document (DCD) Revision: (below)

PRA Revision: None

Technical Report (TR) Revision: None

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Design Control Document (DCD) Revision: ~~None~~

Modify Section 3H.1, "Introduction," as follows:

3H.1 Introduction

[This appendix summarizes the structural design and analysis of structures identified as "Critical Sections" in the auxiliary and shield buildings. The design summaries include the following information:

- *Description of buildings*
- *Governing codes and regulations*
- *Structural loads and load combinations*
- *Global analyses*
- *Structural design of critical structural elements*

*Subsections 3H.2 through 3H.4 include a general description of the auxiliary building, a summary of the design criteria and the global analyses. Examples of the structural design are shown for twelve critical sections which are identified in subsection 3H.5 and shown in Figures 3H.5-1 (3 sheets). Representative design details are provided for these structures in subsection 3H.5.]**

[Changes in the values in the critical section tables that are designated as Tier 2 must be reported to the NRC if a change to design parameters is required. These design parameters include reinforcement provided, concrete strength, and steel section size. Changes in the values of loads, moments, and forces in the critical section tables that are designated as Tier 2* must be reported to the NRC if the change results in a required reinforcement (or plate thickness for CA modules) increase greater than the larger of 20% of the required reinforcement value in the table or a change equal to 10% of the provided reinforcement (or plate thickness for CA modules).]**

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Update Table 3H.5-1, "Nuclear Island: Design Temperatures For Thermal Gradient," as follows:

Table 3H.5-1
[NUCLEAR ISLAND: DESIGN TEMPERATURES FOR THERMAL GRADIENT]*(1)
(Table information unchanged)

Notes:

1. *N/R means loads due to a thermal gradient are not required to be considered.*
2. *Based on ACI 349-01 (Appendix A), the base temperature for the construction is assumed to be 70°F.*

(1) See Subsection 3H.1 for reporting requirements for changes to Tier 2* information in Appendix 3H.

~~*NRC Staff approval is required prior to implementing a change in this information; see DCD Introduction Section 3.5.~~

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Update Table 3H.5-2, "Exterior Wall On Column Line 1: Forces And Moments In Critical Locations," as follows:

~~Table 3H.5-2 not used.~~

Table 3H.5-2						
[EXTERIOR WALL AT COLUMN LINE 1 FORCES AND MOMENTS IN CRITICAL LOCATIONS]*(1)						
(Units: kips, ft)						
Load Combination	M_X	M_Y	M_{XY}	T_X	T_Y	T_{XY}
<i>Elevation 180'-0" to 135'-3"</i>						
$D + L + H + Ta$		177.8	3.1		115.5	8.8
$1.05 D + 1.3 L + 1.3 H + 1.2 To$	106.4		5.6	117.0		23.9
<i>Elevation 135'-3" to 100'-0"</i>						
$D + L + H + Ta$		50.8	0.3		89.8	104.8
$D + L + H + Ta$	82.9		7.6	172.9		24.8
$D + L + H + Ta$	60.0		3.6	165.7		106.0
<i>Elevation 100'-0" to 82'-6"</i>						
$1.05 D + 1.3 L + 1.3 H + 1.2 To$		48.1	8.4		106.1	17.3
$D + L + Es$	1.8		5.4	15.6		58.6
<i>Elevation 82'-6" to 66'-6"</i>						
$D + L - Es$		93.8	26.5		170.7	31.5
$0.9 D + Es$		32.7	27.2		182.1	42.4
$0.9 D + Es$	15.5		27.2	18.6		42.4
Note: X is along the horizontal direction, and Y is in the vertical direction.						

(1) See Subsection 3H.1 for reporting requirements for changes to Tier 2* information in Appendix 3H.

*NRC Staff approval is required prior to implementing a change in this information; see DCD Introduction Section 3.5.

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Update Table 3H.5-3, "Exterior Wall On Column Line 1: Details Of Wall Reinforcement," as follows:

Table 3H.5-3	
[EXTERIOR WALL ON COLUMN LINE 1 DETAILS OF WALL REINFORCEMENT (in²/ft)]*(1) <i>(See Figure 3H.5-2 for Locations of Wall Sections.)</i>	
(Table information unchanged)	

(1) See Subsection 3H.1 for reporting requirements for changes to Tier 2* information in Appendix 3H.
~~*NRC Staff approval is required prior to implementing a change in this information; see DCD Introduction Section 3.5.~~

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Update Table 3H.5-4, "Interior Wall At Column Line 7.3: Forces And Moments In Critical Locations," as follows:

Table 3H.5-4 not used.

Table 3H.5-4						
[INTERIOR WALL AT COLUMN LINE 7.3 FORCES AND MOMENTS IN CRITICAL LOCATIONS]*(1)						
(Units: kips, ft)						
Load Combination	M_X	M_Y	M_{XY}	T_X	T_Y	T_{XY}
From Roof to Elevation 155'-6"						
1.05 D + 1.3 L + 1.2 To		135.3	10.9		117.3	210.2
1.05 D + 1.3 L + 1.2 To	75.5		4.1	229.8		94.3
Elevation 155'-6" to 135'-3"						
0.9 D - Es		14.1	1.3		160.8	228.7
D + L - Es	28.0		1.0	29.8		231.7
Elevation 135'-3" to 117'-6"						
0.9 D - Es		3.3	1.3		142.2	140.9
D + L - Es	10.0		1.0	41.7		175.0
Elevation 117'-6" to 100'-0"						
0.9 D - Es		4.7	2.8		143.9	184.9
D + L + Es	6.4		1.5	172.8		107.9
Elevation 100'-0" to 82'-6"						
0.9 D - Es		15.4	2.6		90.4	169.8
D + L - Es	8.7		2.6	46.6		175.6
Elevation 82'-6" to 66'-6"						
0.9 D - Es		23.5	1.3		80.9	49.3
D + L - Es	0.8		1.3	1.7		74.1

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Note:

X is along the horizontal direction, and Y is in the vertical direction.

(1) See Subsection 3H.1 for reporting requirements for changes to Tier 2* information in Appendix 3H.

*NRC Staff approval is required prior to implementing a change in this information; see DCD Introduction Section 3.5.

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Update Table 3H.5-5, "Exterior Wall On Column Line 1: Details Of Wall Reinforcement," as follows:

Table 3H.5-3	
[EXTERIOR WALL ON COLUMN LINE 1 DETAILS OF WALL REINFORCEMENT (in²/ft)]*(1) <i>(See Figure 3H.5-2 for Locations of Wall Sections.)</i>	
(Table information unchanged)	

(1) See Subsection 3H.1 for reporting requirements for changes to Tier 2* information in Appendix 3H.
~~*NRC Staff approval is required prior to implementing a change in this information; see DCD Introduction Section 3.5.~~

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Insert Table 3H.5-6, "Interior Wall At Column Line L: Forces And Moments In Critical Locations," as follows

Table 3H.5-6 not used.

Table 3H.5-6						
[INTERIOR WALL AT COLUMN LINE L FORCES AND MOMENTS IN CRITICAL LOCATIONS]*(1)						
<i>(Units: kips, ft)</i>						
Load Combination	M_x	M_y	M_{xy}	T_x	T_y	T_{xy}
Elevation 154'-2" to 135'-3"						
$0.9 D + Es + Pa + Yj$		6.0	3.5		115.4	170.2
$0.9 D + Es + Pa + Yj$	14.3		3.5	46.0		170.2
Elevation 135'-3" to 117'-6"						
$0.9 D + Es + Pa + Yj$		145.3	12.2		26.0	38.2
$0.9 D + Es + Pa + Yj$	24.5		7.1	15.5		114.9
Note: X is along the horizontal direction, and Y is in the vertical direction.						

(1) See Subsection 3H.1 for reporting requirements for changes to Tier 2* information in Appendix 3H.

*NRC Staff approval is required prior to implementing a change in this information; see DCD Introduction Section 3.5.

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Update Table 3H.5-7, "Interior Wall At Column Line L: Forces Details Of Wall Reinforcement," as follows

Table 3H.5-7			
[INTERIOR WALL ON COLUMN LINE L DETAILS OF WALL REINFORCEMENT]*(1) (SEE FIGURE 3H.5-2, SHEET 3, FOR LOCATIONS OF WALL SECTIONS.)			
Wall Segment	Location	Wall Section	Reinforcement (in ² /ft ²)
			Provided
Elevation 154'-2" to 135'-3"	Horizontal	1	2.27
	Vertical	3	3.12
Elevation 135'-3" to 117'-6"	Horizontal	2	4.39
	Vertical	4	5.66
Shear Reinforcement:			
Elevation 154'-2" to 135'-3"	Standard hook or T headed bar	5	0.11
Elevation 135'-3" to 117'-6"	Standard hook or T headed bar	5 6	2.00

(1) See Subsection 3H.1 for reporting requirements for changes to Tier 2* information in Appendix 3H.

*NRC Staff approval is required prior to implementing a change in this information; see DCD Introduction Section 3.5.

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Revise Table 3H.5-8, "Design Summary Of Spent Fuel Pool Wall: Design Loads, Load Combinations, And Comparisons To Acceptance Criteria," as follows:

Table 3H.5-8 (Sheet 1 of 3)

~~[DESIGN SUMMARY OF SPENT FUEL POOL WALL: ELEMENT NO. 20477]*~~

Notes:

See Figure 3H.5-10 for element location.

Plate thickness provided is 0.50 inches, which is much greater than the plate thickness required.

Table 3H.5-8 (Sheet 1 of 3)

***[DESIGN SUMMARY OF SPENT FUEL POOL WALL
DESIGN LOADS, LOAD COMBINATIONS, AND COMPARISONS TO
ACCEPTANCE CRITERIA - ELEMENT NO. 20477]*(1)***

Load/Comb.	S_{xx} kip/ft	S_{yy} kip/ft	S_{xy} kip/ft	M_{xx} k-ft/ft	M_{yy} k-ft/ft	N_x kip/ft	N_y kip/ft	Comments
Dead (D)	-16.15	-22.92	-28.34	-1.34	-1.06	-0.32	-0.32	
Live (L)	1.46	0.32	-1.57	-0.06	-0.21	0.04	0.03	
Hydro (F)	37.52	12.36	-4.32	-100.50	-14.49	62.14	-9.95	
Seismic (Es)	46.21	56.51	183.20	81.72	28.70	103.00	14.79	
Thermal (To)	-561.80	-267.70	-51.15	-426.90	-145.50	90.32	-23.66	
Thermal (Ta)	-955.80	-444.60	-139.70	-1401.0	-450.00	227.50	-83.16	
LC(1a)	32.40	-14.25	-48.39	-142.68	-22.12	86.61	-14.33	1. 4D+1. 7L+1. 4F
LC(3a)	84.05	51.21	147.24	-60.38	7.15	189.71	0.56	D+L+F+Es
LC(3b)	84.05	51.21	-219.16	-223.82	-50.25	-16.29	-29.02	D+L+F-Es
LC(3e)	-267.08	-116.11	115.28	-327.19	-83.79	246.16	-14.22	D+L+F+Es+To
LC(3f)	-267.08	-116.11	-251.12	-490.63	-141.19	40.16	-43.80	D+L+F-Es+To
LC(3m)	84.20	53.18	151.64	-60.18	7.46	189.71	0.57	0. 9D+F+Es
LC(3n)	84.20	53.18	-214.76	-223.62	-49.94	-16.29	-29.01	0. 9D+F-Es

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LC(3o)	-266.92	-114.13	119.68	-326.99	-83.47	246.16	-14.22	0.9D+F+Es+To
LC(3p)	-266.92	-114.13	-246.72	-490.43	-140.87	40.16	-43.80	0.9D+F-Es+To
LC(5a)	-574.55	-288.12	-121.54	-977.52	-297.00	204.04	-62.22	D+L+F+Ta
LC(7a)	-397.01	-211.45	-74.69	-427.19	-125.72	132.70	-28.49	1.05D+1.3L+1.05F+1.2To
Notes: x- direction is horizontal; y- direction is vertical. See Figure 3H.5-10 for element location. Plate thickness required for load combinations excluding thermal: 0.49 inches Plate thickness provided: 0.50 inches Maximum principal stress for load combination 5a including thermal: 46.33 ksi Yield stress: 65.0 ksi Maximum stress intensity range for load combination 5a including thermal: N/A Allowable stress intensity : 130.0 ksi								

(1) See Subsection 3H.1 for reporting requirements for changes to Tier 2* information in Appendix 3H.

*NRC Staff approval is required prior to implementing a change in this information; see DCD Introduction Section 3.5.

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Table 3H.5-8 (Sheet 2 of 3)

[DESIGN SUMMARY OF SPENT FUEL POOL WALL: ELEMENT NO. 10529]*

Notes:

See Figure 3H.5-10 for element location.

Plate thickness provided is 0.50 inches, which is much greater than the plate thickness required.

Table 3H.5-8 (Sheet 2 of 3)

**[DESIGN SUMMARY OF SPENT FUEL POOL WALL
DESIGN LOADS, LOAD COMBINATIONS, AND COMPARISONS TO
ACCEPTANCE CRITERIA - ELEMENT NO. 10529]*(1)**

Load/Comb.	S_{xx} kip/ft	S_{yy} kip/ft	S_{xy} kip/ft	M_{xx} k-ft/ft	M_{yy} k-ft/ft	N_x kip/ft	N_y kip/ft	Comments
Dead (D)	-24.40	-96.30	-20.71	-1.16	-2.27	-0.28	-0.34	
Live (L)	-0.44	-2.48	-0.55	-0.01	-0.24	0.01	0.08	
Hydro (F)	9.86	-5.49	6.22	8.37	-73.49	16.94	16.02	
Seismic (Es)	110.80	335.20	95.73	19.03	93.81	22.15	29.34	
Thermal (To)	-215.70	-479.30	-150.10	-99.69	-357.90	16.39	19.34	
Thermal (Ta)	-389.40	-883.60	-273.20	-364.10	-982.20	40.42	17.26	
LC(1a)	-21.10	-146.72	-21.23	10.09	-106.48	23.34	22.09	1. 4D+1. 7L+1. 4F
LC(3a)	99.77	228.74	83.17	29.58	-11.59	45.60	51.51	D+L+F+Es
LC(3b)	99.77	228.74	-108.29	-8.48	-199.21	1.30	-7.17	D+L+F-Es
LC(3e)	-35.05	-70.83	-10.64	-32.72	-235.28	55.84	63.60	D+L+F+Es+To
LC(3f)	-35.05	-70.83	-202.10	-70.78	-422.90	11.54	4.92	D+L+F-Es+To
LC(3m)	102.64	240.85	85.80	29.71	-11.12	45.61	51.47	0. 9D+F+Es
LC(3n)	102.64	240.85	-105.66	-8.35	-198.74	1.31	-7.21	0. 9D+F-Es
LC(3o)	-32.17	-58.72	-8.02	-32.60	-234.81	55.86	63.55	0. 9D+F+Es+To

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<i>LC(3p)</i>	-32.17	-58.72	-199.48	-70.66	-422.43	11.56	4.87	<i>0.9D+F-Es+To</i>
<i>LC(5a)</i>	-258.35	-656.52	-185.79	-220.36	-689.88	41.93	26.55	<i>D+L+F+Ta</i>
<i>LC(7a)</i>	-177.61	-469.58	-128.51	-67.20	-348.29	29.80	31.07	<i>1.05D+1.3L+1.05F+1.2To</i>
Notes: x- direction is horizontal; y- direction is vertical. See Figure 3H.5-10 for element location. Plate thickness required for load combinations excluding thermal: 0.47 inches Plate thickness provided: 0.50 inches Maximum principal stress for load combination 5a including thermal: 33.52 ksi Yield stress: 65.0 ksi Maximum stress intensity range for load combination 5a including thermal: N/A Allowable stress intensity : 130.0 ksi								

(1) See Subsection 3H.1 for reporting requirements for changes to Tier 2* information in Appendix 3H.

*NRC Staff approval is required prior to implementing a change in this information; see DCD Introduction Section 3.5.

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Table 3H.5-8 (Sheet 3 of 3)

[DESIGN SUMMARY OF SPENT FUEL POOL WALL- ELEMENT NO. 10544]*

Notes:

See Figure 3H.5-10 for element location.

Plate thickness provided is 0.50 inches, which is much greater than the plate thickness required.

Table 3H.5-8 (Sheet 3 of 3)

**[DESIGN SUMMARY OF SPENT FUEL POOL WALL
DESIGN LOADS, LOAD COMBINATIONS, AND COMPARISONS TO
ACCEPTANCE CRITERIA - ELEMENT NO. 10544]*(1)**

Load/Comb.	S_{xx} kip/ft	S_{yy} kip/ft	S_{xy} kip/ft	M_{xx} k-ft/ft	M_{yy} k-ft/ft	N_x kip/ft	N_y kip/ft	Comments
Dead (D)	-20.03	-75.69	-42.72	3.53	-2.18	-0.01	-1.93	
Live (L)	-0.64	-1.98	-1.22	0.36	-0.06	0.02	-0.07	
Hydro (F)	-4.13	-2.97	-4.10	39.78	3.54	0.99	-4.80	
Seismic (Es)	67.42	185.70	113.20	48.28	7.62	5.78	5.32	
Thermal (To)	-121.60	-387.30	-239.80	75.83	-107.40	39.64	49.91	
Thermal (Ta)	-215.20	-670.10	-416.60	184.20	-269.30	115.50	136.20	
LC(1a)	-34.91	-113.49	-67.62	61.25	1.81	1.40	-9.54	1.4D+1.7L+1.4F
LC(3a)	40.97	103.87	63.52	107.86	10.34	7.18	-3.41	D+L+F+Es
LC(3b)	40.97	103.87	-162.88	11.30	-4.90	-4.39	-14.04	D+L+F-Es
LC(3e)	-35.03	-138.19	-86.36	155.26	-56.79	31.95	27.79	D+L+F+Es+To
LC(3f)	-35.03	-138.19	-312.76	58.70	-72.02	20.39	17.15	D+L+F-Es+To
LC(3m)	43.61	113.42	69.01	107.15	10.61	7.16	-3.14	0.9D+F+Es
LC(3n)	43.61	113.42	-157.39	10.59	-4.62	-4.41	-13.78	0.9D+F-Es
LC(3o)	-32.39	-128.64	-80.87	154.54	-56.51	31.93	28.05	0.9D+F+Es+To

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LC(3p)	-32.39	-128.64	-307.27	57.98	-71.75	20.37	17.41	$0.9D+F-Es+To$
LC(5a)	-159.30	-499.45	-308.41	158.79	-167.01	73.19	78.32	$D+L+F+Ta$
LC(7a)	-117.40	-375.64	-230.60	102.82	-79.20	30.78	30.27	$1.05D+1.3L+1.05F+1.2To$
Notes: x- direction is horizontal; y- direction is vertical. See Figure 3H.5-10 for element location. Plate thickness required for load combinations excluding thermal: 0.31 inches Plate thickness provided: 0.50 inches Maximum principal stress for load combination 5a including thermal: 46.95 ksi Yield stress: 65.0 ksi Maximum stress intensity range for load combination 5a including thermal: N/A Allowable stress intensity : 130.0 ksi								

(1) See Subsection 3H.1 for reporting requirements for changes to Tier 2* information in Appendix 3H.

*NRC Staff approval is required prior to implementing a change in this information; see DCD Introduction Section 3.5.

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Response to Request For Additional Information (RAI)

Replace Table 3H.5-10, "Design Summary Of Roof At Elevation 180'-0", Area 6 (Near Shield Building Interface)," as follows:

Table 3H.5-10	
[DESIGN SUMMARY OF ROOF AT ELEVATION 180'-0", AREA 6]*	
(Near Shield Building Interface)	
Governing Load Combination (Roof Girder)	
Combination Number	3—Extreme Environmental Condition Downward Seismic Acceleration
Bending Moment: Allowable Stress	= 33.3 ksi > Actual Stress
Shear Force: Allowable Stress	= 20.1 ksi > Actual Stress
Governing Load Combination (Concrete Slab)	
Parallel to the Girders	3—Extreme Environmental Condition
Combination Numbers	3—Extreme Environmental Condition
Reinforcement (Each Face)	= 2.54 in²/ft > Required
Provided	= 2.54 in²/ft > Required
Perpendicular to the Girders	3—Extreme Environmental Condition
Combination Numbers	3—Extreme Environmental Condition
Reinforcement (Each Face)	= 3.12 in²/ft > Required
Provided	= 3.12 in²/ft > Required

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Table 3H.5-10

**[DESIGN SUMMARY OF ROOF AT ELEVATION 180'-0", AREA 6
(NEAR SHIELD BUILDING INTERFACE)]*(1)**

Governing Load Combination (Roof Girder)	
<i>Combination Number</i>	<i>3 – Extreme Environmental Condition Downward Seismic Acceleration</i>
<i>Bending Moment</i>	<i>= 7125 kips-ft</i>
<i>Corresponding Stress</i>	<i>= 24.1 ksi</i>
<i>Allowable Stress</i>	<i>= 38.0 ksi</i>
<i>Shear Force</i>	<i>= 447 kips</i>
<i>Corresponding Stress</i>	<i>= 17.0 ksi</i>
<i>Allowable Stress</i>	<i>= 20.1 ksi</i>
Governing Load Combination (Concrete Slab)	
<i>Parallel to the Girders</i>	
<i>Combination Numbers</i>	<i>3 – Extreme Environmental Condition</i>
<i>Reinforcement (Each Face)</i>	
<i>Required</i>	<i>= 1.74 in²/ft</i>
<i>Provided</i>	<i>= 2.54 in²/ft</i>
<i>Perpendicular to the Girders</i>	
<i>Combination Numbers</i>	<i>3 – Extreme Environmental Condition</i>
<i>Reinforcement (Each Face)</i>	
<i>Required</i>	<i>= 1.68 in²/ft</i>
<i>Provided</i>	<i>= 3.12 in²/ft</i>

(1) See Subsection 3H.1 for reporting requirements for changes to Tier 2* information in Appendix 3H.

*NRC Staff approval is required prior to implementing a change in this information; see DCD Introduction Section 3.5.

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Response to Request For Additional Information (RAI)

Replace Table 3H.5-11, "Design Summary Of Floor At Elevation 135'-3": Area 1 (Between Column Lines M And P)," as follows:

Table 3H.5-11	
[DESIGN SUMMARY OF FLOOR AT ELEVATION 135'-3" AREA 1 (BETWEEN COLUMN LINES M AND P)]*	
<i>Governing Load Combination (Steel Beam)</i>	
<i>Load Combination</i>	3 — Extreme Environmental Condition Downward Seismic
<i>Bending Moment</i> <i>Allowable Stress</i>	= 33.26 ksi > Actual stress
<i>Shear Force</i> <i>Allowable Stress</i>	= 20.1 ksi > Actual stress
<i>Governing Load Combination (Concrete Slab)</i>	
<i>Parallel to the Beams</i>	
<i>Load Combination</i>	3 — Extreme Environmental Condition Downward Seismic
<i>Reinforcement (Each Face)</i> <i>Provided</i>	= 0.44 in²/ft > Required
<i>Perpendicular to the Beams</i>	
<i>Load Combination</i>	Normal Condition
<i>Reinforcement (Each Face)</i> <i>Provided</i>	= 0.60 in²/ft > Required

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Table 3H.5-11

**[DESIGN SUMMARY OF FLOOR AT ELEVATION 135'-3"
AREA 1 (BETWEEN COLUMN LINES M AND P)]*(1)**

Governing Load Combination (Steel Beam)

<i>Load Combination</i>	<i>3 – Extreme Environmental Condition Downward Seismic</i>
<i>Bending Moment</i>	<i>= (-) 63.9 kips-ft</i>
<i>Corresponding Stress</i>	<i>= 17.0 ksi</i>
<i>Allowable Stress</i>	<i>= 33.26 ksi</i>
<i>Shear Force</i>	<i>= 30.7 kips</i>
<i>Corresponding Stress</i>	<i>= 8.7 ksi</i>
<i>Allowable Stress</i>	<i>= 20.1 ksi</i>

Governing Load Combination (Concrete Slab)

<i>Parallel to the Beams</i>	
<i>Load Combination</i>	<i>3 – Extreme Environmental Condition Downward Seismic</i>
<i>Bending Moment</i>	<i>= (-) 16.0 kips-ft</i>
<i>In-plane Shear</i>	<i>= 20.0 kips (per foot width of the slab)</i>
<i>Reinforcement (Each Face)</i>	
<i>Required</i>	<i>= 0.41 in²/ft</i>
<i>Provided</i>	<i>= 0.44 in²/ft</i>
<i>Perpendicular to the Beams</i>	
<i>Combination Number</i>	<i>Normal Condition</i>
<i>Bending Moment</i>	<i>= (+) 6.66 kips-ft (per foot width of the slab)</i>
<i>Reinforcement (Each Face)</i>	
<i>Required</i>	<i>= 0.28 in²/ft</i>
<i>Provided</i>	<i>= 0.60 in²/ft</i>

(1) See Subsection 3H.1 for reporting requirements for changes to Tier 2* information in Appendix 3H.

*NRC Staff approval is required prior to implementing a change in this information; see DCD Introduction Section 3.5.

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Replace Table 3H.5-12, "Design Summary Of Floor At Elevation 135'-3" (Operator Work Area (previously known as 'Tagging Room') Ceiling," as follows:

Table 3H.5-12	
{DESIGN SUMMARY OF FLOOR AT ELEVATION 135'-3" (OPERATIONS WORK AREA (TAGGING ROOM) CEILING)}*	
Design of Precast Concrete Panels	
Governing Load Combination	Construction
Bottom Reinforcement (E/W Direction)	
 Provided	= 0.79 in²/ft
Top Reinforcement (E/W Direction)	
 Required	= (Minimum required by Code)
 Provided	= 0.20 in²/ft
Top and Bottom Reinforcement (N/S Direction)	
 Required	= (Minimum required by Code)
 Provided	= 0.20 in²/ft
Design of 24-inch-Thick Slab	
Governing Load Combination	Extreme Environmental Condition (SSE)
Bottom Reinforcement (E/W Direction)	
 Provided	= 1.00 in²/ft > Required
Top Reinforcement (E/W Direction)	
 Provided	= 1.00 in²/ft > Required
Top and Bottom Reinforcement (N/S Direction)	
 Provided	= 0.79 in²/ft > Required

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Table 3H.5-12

[DESIGN SUMMARY OF FLOOR AT ELEVATION 135'-3" (OPERATOR WORK AREA (PREVIOUSLY KNOWN AS 'TAGGING ROOM') CEILING)]*(1)

Design of Precast Concrete Panels

<i>Governing Load Combination</i>	<i>Construction</i>
<i>Design Bending Moment (Midspan)</i>	= 14.53 kip-ft/ft
<i>Bottom Reinforcement (E/W Direction)</i>	
<i>Required</i>	= 0.58 in ² /ft
<i>Provided</i>	= 0.79 in ² /ft
<i>Top Reinforcement (E/W Direction)</i>	
<i>Required</i>	= (Minimum required by Code)
<i>Provided</i>	= 0.20 in ² /ft
<i>Top and Bottom Reinforcement (N/S Direction)</i>	
<i>Required</i>	= (Minimum required by Code)
<i>Provided</i>	= 0.20 in ² /ft

Design of 24-inch-Thick Slab

<i>Governing Load Combination</i>	<i>Extreme Environmental Condition (SSE)</i>
<i>Design Bending Moment (E/W Direction) Midspan</i>	= 14.40 kips ft/ft
<i>Design In-plane Shear</i>	= 31.9 kips/ft
<i>Design In-plane Tension</i>	= 21.9 kips/ft
<i>Bottom Reinforcement (E/W Direction)</i>	
<i>Required</i>	= 0.53 in ² /ft
<i>Provided</i>	= 0.79 in ² /ft
<i>Design Bending Moment (E/W Direction) at Support</i>	= 28.81 kips-ft/ft
<i>Design In-plane Shear</i>	= 31.9 kips/ft
<i>Design In-plane Tension</i>	= 21.9 kips/ft
<i>Top Reinforcement (E/W Direction)</i>	
<i>Required</i>	= 0.93 in ² /ft
<i>Provided</i>	= 1.00 in ² /ft
<i>Design Bending Moment (N/S Direction)</i>	= 8.47 kips ft/ft
<i>Design In-plane Shear</i>	= 31.9 kips/ft
<i>Design In-plane Tension</i>	= 27.2 kips/ft
<i>Top and Bottom Reinforcement (N/S Direction)</i>	

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<i>Required</i>	$= 0.59 \text{ in}^2/\text{ft}$
<i>Provided</i>	$= 0.79 \text{ in}^2/\text{ft}$

(1) See Subsection 3H.1 for reporting requirements for changes to Tier 2* information in Appendix 3H.

*NRC Staff approval is required prior to implementing a change in this information; see DCD Introduction Section 3.5.

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Response to Request For Additional Information (RAI)

Replace Table 3H.5-13, "Design Summary Of Floor At Elevation 135'-3" Area 1 (Main Control Room Ceiling)," as follows:

Table 3H.5-13
[DESIGN SUMMARY OF FLOOR AT ELEVATION 135'-3" AREA 1 (MAIN CONTROL ROOM CEILING)]*
<i>The design of the bottom plate with fins is governed by the construction load.</i>
<i>The design evaluation results are summarized below:</i> <ul style="list-style-type: none"><i>The actual area of the tension steel is 9.0 in², which provides a design strength of 518.5 kips-ft bending moment capacity. This is larger than the required capacity.</i><i>The design shear strength is 23.22 kips. This is larger than the required capacity.</i><i>The shear studs are spaced 9 inches c/c, in both directions. The calculated required spacing is 9.06 inches.</i>

Table 3H.5-13
[DESIGN SUMMARY OF FLOOR AT ELEVATION 135'-3" AREA 1 (MAIN CONTROL ROOM CEILING)]*(1)
<i>The design of the bottom plate with fins is governed by the construction load.</i>
<i>For the composite floor, the design forces used for the evaluation of a typical 9-inch-wide strip of the slab are as follows:</i> <i>Maximum bending moment = +35.0 (-24.4) kips-ft</i> <i>Maximum shear force = 22.3 kips</i>
<i>The design evaluation results are summarized below:</i> <ul style="list-style-type: none"><i>The actual area of the tension steel is 9.0 in², which provides a design strength of 518.5 kips-ft bending moment capacity.</i><i>The design shear strength is 23.22 kips.</i><i>The shear studs are spaced 9 inches c/c, in both directions. The calculated required spacing is 9.06 inches.</i>

(1) See Subsection 3H.1 for reporting requirements for changes to Tier 2* information in Appendix 3H.

*NRC Staff approval is required prior to implementing a change in this information; see DCD Introduction Section 3.5.