



Westinghouse Electric Company
Nuclear Power Plants
P.O. Box 355
Pittsburgh, Pennsylvania 15230-0355
USA

U.S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, D.C. 20555

Direct tel: 412-374-6206
Direct fax: 724-940-8505
e-mail: sisk1rb@westinghouse.com

Your ref: Docket No. 52-006
Our ref: DCP_NRC_002639

September 29, 2009

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-SRP-3.8.2-SEB1-02 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', written over a horizontal line.

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
	E. McKenna	- U.S. NRC	1E
	B. Gleaves	- U.S. NRC	1E
	T. Spink	- TVA	1E
	P. Hastings	- Duke Power	1E
	R. Kitchen	- Progress Energy	1E
	A. Monroe	- SCANA	1E
	P. Jacobs	- Florida Power & Light	1E
	C. Pierce	- Southern Company	1E
	E. Schmiech	- Westinghouse	1E
	G. Zinke	- NuStart/Entergy	1E
	R. Grumbir	- NuStart	1E
	D. Lindgren	- Westinghouse	1E

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-SRP-3.8.2-SEB1-02

Revision: 1

Question:

Section 3.8.2.2, as well as other sections of the DCD related to structures, refers to DCD Section 1.9 for discussion of compliance with regulatory guides. The staff notes that for Regulatory Guides 1.7 and 1.57 the DCD complies with earlier revisions of the regulatory guides. For Regulatory Guide 1.160, the DCD indicates that it is not applicable to the AP1000 design certification and that Section 17.5 defines the responsibility for a plant maintenance program. Regulatory Guide 1.199 is not described at all in Section 1.9 of the DCD.

In view of the extension of the AP1000 design to soil sites, reanalysis for updated seismic spectra, design changes made to structures, and to ensure that the AP1000 meets the safety requirements in current staff positions, the staff requests Westinghouse to indicate whether the design, construction, and inspection of the AP1000 plant comply with the current regulatory guides stated above or explain how following the existing versions of the regulatory guides or Section 17.5 (for the plant maintenance program), referred to in the DCD, provides an equivalent level of safety to the guidance in the current versions of the regulatory guides. Describe the basis for the use of each regulatory guide, or alternative, separately.

In the case of Regulatory Guide 1.199, "Anchoring Components and Structural Supports in Concrete," what are the alternative requirements or criteria Westinghouse are using to meet the NRC's regulations in the design, evaluation, and quality assurance of anchors (steel embedments) used for component and structural supports on concrete structures as required by GDC 1, "Quality Standards and Records," GDC 2, "Design Bases for Protection Against Natural Phenomena," and GDC 4, "Environmental and Dynamic Effects Design Bases."

If your response to this request for additional information will reference Revision 17 to the AP1000 DCD, please provide an exact reference.

Additional Question

Design criteria/approach used by W vs the guidance contained in several key NRC regulatory guides not referenced in DCD. Westinghouse is requested to compare their design criteria/approach to the guidance contained in several key NRC regulatory guides. Westinghouse will provide a revised RAI response to address this item.

Westinghouse Response:

Response Revision 1

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Addition information is provided for Regulatory Guide 1.160 and Regulatory Guide 1.199 in Revision 1 of the response.

Regulatory Guide 1.7:

The current AP1000 certified design is consistent with Revision 3 of Regulatory Guide 1.7 (issued in March 2007). The AP1000 containment design is a passive system, using convective mixing. Design features promote free circulation of the containment atmosphere. NUREG-1793, "Final Safety Evaluation Report Related to the Certification of the AP1000 Standard Design, Docket 52-006," USNRC, Washington, DC, September 2004 (NUREG-1793), documents an analysis of the effectiveness of the passive mixing. Section 6.2.5.5 of NUREG-1793 concluded:

"The (U.S. Nuclear Regulatory Commission) staff has determined that the Containment hydrogen control system meets the requirements of GDC 41 and 10 CFR 50.44, as well as the guidelines of draft RG 1.7, Revision 3."

Therefore, it can be concluded that there is no technical or safety issue impact due to this Regulatory Guide revision on the AP1000 design, design processes, or licensing documentation.

Regulatory Guide 1.57:

RG 1.57 Revision 1 (issued in March 2007) endorses ASME Boiler & Pressure Vessel Code (B&PV), Section III, "Rules for Construction of Nuclear Facility Components," Division 1, Subsection NE, "Class MC Components," 2001 Edition with 2003 Addenda and Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," 2001 Edition with 2003 Addenda.

The containment vessel is designed to meet the requirements of ASME B&PV Code, Section III, "Rules for Construction of Nuclear Facility Components," Division 1, Subsection NE, "Class MC Components," 2001 Edition including 2002 Addenda. The 2003 Addenda did not include any requirements to impact the design of the containment vessel described in the DCD. There are only two changes (which are in Subsection NE-5000 "Examination") and are related to the examination of the welds and do not impact the design.

- NE-5222 socket welds: Socket welds shall be examined by the magnetic particle or liquid penetrant method.
- NE-5261 butt welded joints: All butt welded joints in pressure retaining parts not included in Categories A, B, C, and D – such as doors, opening frames, permanent attachments, and similar constructions – shall be radiographed.

Therefore, the containment vessel design is in conformance with this Regulatory Guide.

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Regulatory Guide 1.160

Regulatory Guide 1.160 provides guidance on the effectiveness of maintenance at nuclear power plants. This guidance is provided for the establishment of maintenance programs consistent with the maintenance rule (10 CFR 50.65). This regulatory guide has no impact on the design, analysis, fabrication, or construction of the AP1000 containment. DCD Appendix 1A addresses the conformance of the AP1000 with Regulatory Guide 1.160. As noted in DCD Appendix 1A, Regulatory Guide 1.160 is "Not applicable to AP1000 design certification. Section 17.5 defines the responsibility for a Plant Maintenance Program." In Subsection 17.5.6 the Combined License information required to address the maintenance rule is provided. Section 17.5 has no impact on the design, analysis, fabrication, or construction of the AP1000 containment design. There are no special maintenance requirements for the containment identified in Subsection 3.8.2.

Regulatory Guide 1.199:

This new Regulatory Guide (Revision 0) was issued in November 2003, to provide guidance to licensees and applicants on methods acceptable to the U.S. NRC staff for complying with the U.S. NRC regulations in the design, evaluation, and quality assurance of anchors (steel embedments) used for component and structural supports on concrete structures. As a result of studies and tests performed, questions were raised regarding the design methodology used in Appendix B to American Concrete Institute (ACI) 349-80. After an extensive review of available test data, the ACI 349 code committee issued a revision to ACI 349 Appendix B in February 2001.

This Regulatory Guide 1.199 generally endorses Appendix B to ACI 349-01, with exceptions in the area of load combinations.

- The AP1000 nuclear island concrete structures are designed to meet the requirements of ACI 349-01 code, including Appendix B on the design of anchors in concrete.
- The load combinations used in the design of nuclear island concrete structures were reviewed and approved by the U.S. NRC, after the release of this Regulatory Guide, in the AP1000 design certification for the hard rock sites.

Itemized conformance with regulatory positions (discussed in Section C of this Regulatory Guide) is given in the attached table.

Design Control Document (DCD) Revision:

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None

PRA Revision:

None

Technical Report (TR) Revision:

None

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Attachment 1 - Itemized Conformance with Regulatory Positions (from Section C of Regulatory Guide 1.199) Positions were provided for C1. through C1.4 I Revision 0. Positions for C1.5 through C7. are provided in Revision 1

REGULATORY POSITION	AP1000 POSITION
<p>C1. The procedures and standards of Appendix B to ACI 349-01 are acceptable to the NRC staff as described and supplemented below. The recommendations are applicable to the types of anchors discussed in Section B.1, "Definitions," and B.2, "Scope," of Appendix B to ACI 349-01.</p>	Conforms
<p>C1.1 The notations and definitions given in Sections B.0 and B.1 of Appendix B to ACI 349-01 are acceptable to the NRC staff.</p>	Conforms
<p>C1.2 The position on load combinations is given in Regulatory Position 1.3. In addition to the guidance of Section B.3.3 of Appendix B, the testing recommendations defined in ASTM E488-96, "Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements," are acceptable to the NRC staff as a guide for establishing a testing program. Test methods not covered by ASTM E488-96 (e.g., combined tension and shear, cracked concrete) should be established and executed using good engineering judgment.</p> <p>ACI 355.2-01, "Evaluating the Performance of Post-Installed Mechanical Anchors in Concrete," provides guidance acceptable to the NRC staff for determining whether post-installed mechanical anchors are acceptable for use in uncracked as well as cracked concrete. For materials consideration, the NRC staff recommends that anchors be fabricated using a material that is compatible with the environment in which they will be installed.</p>	Conforms

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<p>C1.3 The load factors used in Section 9.2.1 of ACI 349-01 are acceptable to the NRC staff except for the following:</p> <p>1.3.1. In load combinations 9, 10, and 11, 1.2To should be used in place of 1.05To.</p> <p>1.3.2. In load combination 6, 1.4Pa should be used in place of 1.25Pa.</p> <p>1.3.3. In load combination 7, 1.25Pa should be used in place of 1.15Pa.</p> <p>1.3.4. The NRC staff endorses Section B.4, "General Requirements for Strength of Structural Anchors," of ACI 349-01. The NRC staff endorses the strength reduction factors given in Section B.4.4; however, load factors consistent with SRP Section 3.8.4, "Other Seismic Category I Structures," should be applied to the load combinations given in Section 9.2 of ACI 349-01.</p>	<p>Conforms</p>
<p>C1.4 The design standards given in Sections B.5, "Design Requirements for Tensile Loading," and B.6, "Design Requirements for Shear Forces," are acceptable to the staff.</p>	<p>Conforms</p>
<p>C1.5 <u>The design standards given in Sections B.7, "Interaction of Tensile and Shear Forces," and B. 8, "Required Edge Distances, Spacing, and Thickness To Preclude Splitting Failure," are acceptable to the NRC staff.</u></p>	<p><u>Conforms</u></p>
<p>C1.6 <u>Section B.9, "Installation of Anchors," is acceptable to the NRC staff.</u></p>	<p><u>Conforms</u></p>

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<p><u>C1.7</u> <u>The design standards given in Sections B.10, "Structural Plates, Shapes, and Specialty Inserts," and B.11, "Shear Capacity of Embedded Plates and Shear Lugs," are acceptable to the NRC staff.</u></p> <p><u>When grouting is the only option, it is recommended that tests be performed in accordance with Sections B.12.3 and B.12.4 of Appendix B.</u></p>	<p><u>Conforms</u></p>
<p><u>C2.</u> <u>All anchors should be inspected to verify that they are of the specified size and type. Installation standards should be consistent with accepted industry-specified tolerances. Anchor systems that are external (that part or portion of the anchor that is not embedded in concrete-visible part) to the concrete surface should be inspected to assure adequate performance during the life of the structure. In addition to the provisions in Section B.9.2 of Appendix B, the NRC staff recommends the following post-installed 6-step inspection program to verify the proper installation of post-installed anchors.</u></p>	<p><u>This paragraph does not have a design requirement.</u></p>
<p><u>C3.</u> <u>All quality assurance standards of ASME NQA-2, 1983, "Quality Assurance Program Requirements for Nuclear Facilities," are applicable to load-bearing steel embedments and other load-bearing components of component and structural supports.</u></p>	<p><u>This paragraph does not have a design requirement..</u></p>
<p><u>C4.</u> <u>The concrete constituents and embedded materials should be compatible with the anticipated environmental conditions to which they will be subjected during the life of the plant.</u></p>	<p><u>Conforms</u></p>
<p><u>C5.</u> <u>Loads and forces on embedments should be properly evaluated to account for baseplate flexibility and eccentricity of connections and the dynamic (strain rate and low-cycle fatigue) effects of loads and forces.</u></p>	<p><u>Conforms</u></p>

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<p><u>C6.</u> <u>The hardness, materials, and heat treatment of high-strength anchor bolts and studs ($F_y > 110$ ksi) should be carefully controlled to prevent environmental and stress-corrosion cracking.</u></p>	<p><u>Conforms</u></p>
<p><u>C7.</u> <u>Because anchors are not generally specified for masonry, the NRC staff does not recommend the use of any type of anchor discussed in this guide to attach Seismic Category I components or systems to concrete block walls that are seismically qualified, except for extremely low load applications. In locations where it is impossible to avoid the use of anchors, users should verify through appropriate means (e.g., pull test) that the supports are structurally acceptable.</u></p>	<p><u>In AP1000 plant design, Seismic Category I components or systems are not attached to concrete block walls.</u></p>