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Your ref: Docket No. 52-006
Our ref: DCP_NRC_002578

July 30, 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 15. 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-SRP3.12-EMB1-08

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
	E. McKenna	- U.S. NRC	1E
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	P. Hastings	- Duke Power	1E
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	G. Zinke	- NuStart/Entergy	1E
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ENCLOSURE 1

Response to Request for Additional Information on SRP Section 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP3.12-EMB1-08
Revision: 0

Question:

DCD Revision 17, subsection 3.9.3.4 stated that the welded connections of ASTM 500 Grade B tube steel members satisfy the requirements of the AISC "Load and Resistance Factor Design (LRFD) Specification for Steel Hollow Structure Sections," dated November 10, 2000.

SRP 3.8.3 II.2, SRP Acceptance Criteria, identified applicable steel structure Codes, Standard, and Specifications. The applicant proposed LRFD Specification is not listed as acceptable. SRP proposed "ANSI/AISC N690-1994 including Supplement 2 (2004)" as an acceptable specification.

ANSI/AISC N690-1994 including Supplement 2 (2004) has been accepted by NRC as ASME Code Case N-570-2. The later LRFD version of AISC N690, ASME Code Case N-721, has not been accepted by NRC. The staff noted that NRC's current acceptable specification is based on Allowable Stress Design (ASD) specification. The staff noted that LRFD method has not been approved for use in the design of new reactor nuclear facilities. The staff is requesting the applicant to identify differences between the two methods and show equivalency with respect to SRP acceptable specification or provide alternative to satisfy the acceptable design requirements.

Westinghouse Response:

As noted in the last paragraph of the request above, the concern is that the Load and Resistance Factor Design (LRFD) approach is being used in lieu of the Allowable Stress Design (ASD).

Although the referenced AISC Specification ("Load and Resistance Factor Design (LRFD) Specification for Steel Hollow Structure Sections," dated November 10, 2000) is given as the basis of evaluating HSS to HSS members, Westinghouse uses the Allowable Stress Design to show connection acceptance.

The ASD approach is documented in Westinghouse engineering document APP-GW-PHC-002 (Reference 1) as follows:

"The 2000 AISC Code (Reference 2) provides the requirements for the strength of welded tube-steel-to-tube-steel connections based on the load and resistance factor design (LRFD). The 2005 AISC Code (Reference 3) provides the allowables both in the LRFD format and in the allowable stress design (ASD) format.

For the load and resistance factor design (LRFD):

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$$R_u \leq \phi R_n$$

where

R_u = required strength (LRFD)

R_n = nominal strength

ϕ = resistance factor

ϕR_n = design strength

For the allowable stress design (ASD):

$$R_a \leq R_n / \Omega$$

where

R_a = required strength (ASD)

R_n = nominal strength

Ω = safety factor

R_n / Ω = allowable strength

The LRFD required strength is based on a factored load, whereas the ASD required strength is the actual load. The ratio of the LRFD required strength to the ASD required strength is the product of phi times omega. For all cases in the 2005 AISC Code (Reference 3), the product is a constant of 1.5.

Since this increase factor is the same as the ASME stress increase factor from Level A to Level C, the ASD required strength will be used for Level A/Level B loads. The ASD required strength times 1.5 (LRFD required strength) will be used for Level C/Level D loads."

As can be seen from the above, the approach utilized by Westinghouse is an Allowable Stress Design (ASD) approach using the equations from the AISC LRFD Specification.

The text in the DCD Revision 17 specifies that the AISC "Load and Resistance Factor Design (LRFD) Specification for Steel Hollow Structure Sections," dated November 10, 2000 be used for welded connections of ASTM 500 Grade B tube steel members. Verbatim compliance with this reference would dictate that an LRFD approach be used for these connections. The intent is to use the allowable connection loads developed in this specification and convert them to equivalent Allowable Stress Design (ASD) allowables. The ASD methodology is used for all other pipe support stress limitations. Therefore, clarification of this intent is provided in the DCD mark-up below.

As noted in the AP1000 Design Control Document (DCD), the AP1000 component and piping support designs satisfy the requirements of the ASME Code Section III, Subsection NF. The

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requirements in the DCD on the welding of members fabricated of tube steel are in addition to the requirements in Subsection NF. These requirements are not considered to be an alternative to the Subsection NF requirements. Use of the requirements outlined in the DCD is not dependent on NRC approval of ASME Code, Section III, Code Case N-570-2 or Code Case N-721

Consistent with the criteria in 10 CFR 50.55a (a)(3)(i), the requirements in the DCD on the welding of members fabricated of tube steel provide an acceptable level of quality and safety because the requirements are assessed using an ASD approach in the same manner as in standards and specifications that the NRC has accepted or approved.

References

1. APP-GW-PHC-002, Documentation of AISC Punching Shear Implementation

Design Control Document (DCD) Revision:

Revise the first paragraph of Subsection 3.9.3.4 as follows:

[The supports for ASME Code, Section III, Class 1, 2, and 3 components including pipe supports satisfy the requirements of the ASME Code, Section III, Subsection NF.] In addition to meeting the requirements of the ASME Code, Section III, Subsection NF, the welded connections of ASTM A500 Grade B tube steel members (Identified as Hollow Structural Sections – HSSs) satisfy the requirements of the AISC “Load and Resistance Factor Design Specification for Steel Hollow Structural Sections,” dated November 10, 2000. The nominal strength of the connections, as provided in Sections 8 and 9 of the AISC “Load and Resistance Factor Design Specification for Steel Hollow Structural Sections,” dated November 10, 2000, will be divided by a safety factor to generate the Allowable Stress Design (ASD) connection capacity. [The boundary between the supports and the building structure is based on the rules found in Subsection NF.]* Table 3.9-3 presents the loading conditions. [Table 3.9-8 summarizes the load combinations. The stress limits are presented in Tables 3.9-9 and 3.9-10 for the various service levels.]**

PRA Revision:

None

Technical Report (TR) Revision:

None