
Shield Building Modular Construction Regulatory Basis

March 18, 2009
Westinghouse Electric

Objective

- This discussion is intended to frame the regulatory issues associated with NRC approval of application of modular construction to the AP1000 Shield building.
- We expect no NRC determination during the meeting.
- Remainder of discussions are technical discussions. These discussions will provide explanation of the design and analysis methodology for the modular construction of the shield building.

Background of Shield Building Design Change

- AP1000 Certified Design was conventional reinforced concrete design principles
- Design was changed to steel surface plate technology to address aircraft impact.
- Aircraft impact was a concern at NRC highest level
- Enhanced Shield Building was included in DCD Revision 16.
- APP-GW-GLR-045 Revision 1 (November 2007) included Enhanced Shield Building

NRC Has Reviewed and Approved Steel Surface Plate Technology

- NRC approved use of steel surface plate technology for Seismic Category I structures including containment internal structures (CIS) and auxiliary building
- NRC approved use of methodology based on adaptation of ACI-349 for design requirements and design criteria.
- NRC reviewed analysis of critical sections including steel plate technology.

NRC Approval of Steel Surface Plate Technology

- In Section 3.8.3.7 Conclusions the FSER concludes
- “For the reasons set forth above in Sections 3.8.3.1 through 3.8.3.6 of this report, the staff concludes that the design of the CIS is acceptable and meets the relevant requirements of 10 CFR 50.55a and GDC 1, 2, 4, and 50.”

Approval of Steel Plate Technology

- In Section 3.8.3.1 the FSER provides the DCD description for containment internal structures (CIS) including DCD Section 3.8.3.1.3, “Structural Wall Modules,”
- In this section the FSER concludes that the descriptive information contain sufficient details and that the descriptive information is acceptable.

Approval of Steel Plate Technology

- In Section 3.8.3.4 Analysis Procedures The FSER considers the modeling and overall analyses of the containment internal structures, including the concrete-filled structural modules
- The FSER concludes that test data on concrete-filled steel modules demonstrate that structural properties are comparable or superior to those of reinforced concrete walls. The staff finds the analysis method, which treats structural modules as reinforced concrete members, to be acceptable.

Conclusions for Steel Plate Technology Approval

- The design and analysis method for SC construction is certification information and is documented in the FSER.
- NRC review and approval of the design and analysis method for SC construction was completed for the Design Certification does not need to be included in the supplemental FSER.
- The supplemental FSER for the Design Certification amendment only needs to address the application of the methodology to the shield building wall

Approval of ACI-349 Use

- In Section 3.8.3.2 Applicable Codes, Standards, and Specifications the FSER identifies the codes and standard used for the CIS and states
- The staff finds that the Codes, standards, and specifications identified in the DCD for the design of the CIS are consistent with the guidelines in SRP
- The staff concludes that the Codes, standards, and specifications used in the AP1000 design (including ACI-349) are acceptable.

NRC Reviewed Critical Sections Using Structural Modules

- DCD Section 3.8.3.5.8.1 Structural Wall Modules identifies critical sections using structural modules.
 - South west wall of the refueling cavity (4' 0" thick)
 - South wall of west steam generator cavity (2' 6" thick)
 - North east wall of in-containment refueling water storage tank (2' 6" thick)
- The NRC staff reviewed these critical sections.

Regulatory Basis from Design Certification

- Use of steel plate technology as a concept has been found to be acceptable. There is no regulatory reason to rule the concept out.
- Adaptation of ACI-349 for the steel plate technology is acceptable and not ruled out by regulatory requirements.
- Westinghouse must demonstrate that the shield building design implements the commitments and design requirements previously accepted.

Activities to support Application of SC Construction to the Shield Building

- Show that the application of steel plate technology to the shield building is similar to application to containment internals.
- Address the minor variations
 - Curved Sections
 - Effect of internal trusses
- Describe and provide for NRC review the detailed calculations and analysis.

Plan for the balance of the meeting

- Provide information so that the NRC staff understands AP1000 approach, requirements, and implementation.
- Provide an explanation of the design and analysis methodology for the SC construction.
- Show that application of SC construction to the shield building is consistent with what the NRC previously approved.
- The balance of the presentations are technically oriented.

The AP1000 concrete reinforcement design is established.



14

