
REVISED RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.: 403-8454
SRP Section: 6.1.1 – Engineered Safety Features Materials
Application Section: 6.1.1
Date of RAI Issue: 02/10/2016

Question No. 06.01.01-3

Title 10 of the Code of Federal Regulations (10 CFR) Part 50, Appendix A, General Design Criteria 4 requires SSCs to be designed and fabricated to accommodate the effects of environmental conditions during normal, off normal, and accident conditions.

On July 29th, 2015 the staff and KHNP had a public meeting to discuss areas of the APR-1400 FSAR which could be supplemented with more information to improve the quality of the initial staff SER. One FSAR section that was discussed was Section 5.2.3.

Staff Issue #14 requested information on a 0.065% carbon limit for austenitic stainless steels; this carbon limit is greater than the staff recommendations in Regulatory Guide 1.44 “Control of the Processing and Use of Stainless Steel.”

The applicant responded that the 0.065% carbon limit was sufficient because reactor coolant system has a dissolved oxygen limit of 0.10 ppm. This control is an acceptable method for preventing intergranular failure as it is described in RG 1.44.

On November 13, 2015, the applicant provided supplemental information (ML15321A271) which clarified information in the original application and responded to issues identified by the staff. The sensitization controls in FSAR Section 6.1.1 were removed and a reference to FSAR Section 5.2.3 was added. The result of this change was that the sensitization controls for ESF components would be the same as reactor coolant system components.

The water source for the ESF system is the IRWST. This water source is not isolated from the containment atmosphere which allows the dissolved oxygen content to be higher than the 0.10 ppm limit in the RCS. Additionally, the IRWST water is not monitored during operation.

Provide the staff with a justification of how the sensitization controls for ESF components are sufficient considering the dissolved oxygen content of the ESF system is not controlled in the same manner as the reactor coolant system.

Response – (Rev. 1)

Sensitized stainless steel can be susceptible to IGSCC(Intergranular Stress Corrosion Cracking) in water containing dissolved oxygen. However, the ESF material will not be impacted from IGSCC since the ESF material and welding is controlled to prevent this sensitization. DCD Section 6.1.1.1 a. will be revised as shown in the attached mark-up to describe that welding procedures for non L-grade material are verified with ASTM A 262 in accordance with NRC RG 1.44.

Impact on DCD

DCD Section 6.1.1.1 a. will be revised as indicated on the attached mark-up.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environment Report.

6.1 Engineered Safety Features Materials

Material selection and fabrication of ESF components are described in this section. The materials used in ESF systems are selected for compatibility with core cooling coolants and CS solution.

6.1.1 Metallic Materials

The ASME Code that applies to the design and fabrication of the piping and components is specified in Chapter 3. For materials, later editions or addenda of the ASME Code are used as permitted by the ASME Code if the edition or addenda are approved by 10 CFR 50.55a.

6.1.1.1 Materials Selection and Fabrication

ESF materials are selected for compatibility with core cooling coolants and CS solution.

Principal ESF pressure-retaining materials are listed in Table 6.1-1. The ESF materials meet the requirements of the ASME Code as described in Section 5.2.1.

Principal ESF materials inside the containment that are exposed to the CS solution are listed in Table 6.1-2. These materials are chosen to be compatible with the chemical solutions in the CS. The materials used in ESF component construction are reviewed for acceptability prior to release for material procurement. Hydrogen gas generation in the containment is minimized in accordance with the recommendations of U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide (RG) 1.7 (Reference 3) by restricting the use of zinc and aluminum.

The use of mercury shall be prohibited inside containment to prevent reactions with aluminum, stainless steel, NiCrFe alloy 690, and alloys containing copper.

The integrity of the safety-related components of the ESF systems is maintained during all stages of component manufacture and reactor construction as follows:

- a. Sensitization of austenitic stainless steel shall be avoided as described in Section 5.2.3.
- b. Contaminants that are capable of causing stress corrosion cracking are controlled as follows:

Welding procedures to be used for welding material having a carbon content greater than 0.03 percent are verified with ASTM A 262 in accordance with NRC RG 1.44 (Reference 11).