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.:	**391-8462**
SRP Section:	**06.02.02 - Containment Heat Removal Systems**
Application Section:	**6.2.2**
Date of RAI Issue:	**02/01/2016**

Question No. 06.02.02-36

The November 24, 2015, response (ML15328A218) to MCB Issue #3 (KHNP AI 6-19.3) states that the concrete surface area is calculated using a 10D zone of influence (ZOI) rather than 4D. Please clarify these statements about the meaning of the assumed ZOI (where “D” is the number of diameters of the broken pipe). For example, if ZOI in this case refers to that of the coating on the concrete, it should be described as such.

Response

The ZOI for coating is considered to be 4D for qualified epoxy coating and 10D for untopcoated inorganic zinc coating, as described in technical report, APR1400-E-N-NR-14001-P/NP, Design Features to Address GSI-191, Table 3.2-1 and Appendix B.3 (page B10). There is no actual relationship between coating ZOI and concrete surface area ZOI. The ZOI for the concrete surface area is assumed to be 10D to maximize the concrete quantity for conservatism even though all concrete surface area is qualified coated as described in technical report, APR1400-E-N-NR-14001-P/NP, Subsection 3.8.3. The change to DCD section 6.8.4.5.7 provided previously will be revised to include this clarification.

Impact on DCD

The DCD Tier 2, Subsection 6.8.4.5.7 will be revised as shown in the Attachment.

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 Environmental Report.

AI 6-19_6.8_#3

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~~Surrogate suspensions of chemical precipitates representing this chemical debris can be included as an additional debris source to the strainer testing program to qualify the strainer for "chemical effects". The quantities of chemical precipitates are based on reactive material surface areas and quantities, temperature, water level, pH and other parameters related to the plant specific environment and postaccident evolution. The calculated result based on the WCAP-16530-NP (Reference 9) methodology referenced in RG 1.82 (Reference 3) is provided in Table 6.8-3.~~

See next page

6.8.4.5.8 Upstream Effects

The evaluation of upstream effect is a review of the flow paths leading to the IRWST, identifying those flow paths which could result in blocking the return water that could challenge the IRWST minimum water level evaluation. The evaluation also includes identifying the hold-up volumes, such as recessed areas and enclosed rooms, for which trapped water will not return to the IRWST. All of the hold-up volumes were taken account of in the minimum water level calculation. Detail holdup volume is provided in Table 6.8-2.

Figure 6.2.1-20 show a schematic of containment spray and blowdown return pathways, and the schematic of potential water traps in containment. During long-term cooling subsequent to a RCS pipe break, borated water is drawn from the IRWST by the SIPs and injected into the RV for core cooling. This water is ejected to the bottom floor of the containment within the secondary shield wall through the horizontal platforms which are constructed of open grating within the SG compartments. The CSPs also draw water from the IRWST sumps to cool the containment building. This water rains down on all containment surfaces, and then drains to the bottom floor of containment within secondary shield wall and annulus via the stairway and a ring of deck grating around much of the circumference of the building.

Water spilled from RCS break and the uniformly distributed containment spray water drain back to the HVT, and then drains to the IRWST via spillways. Since there are four pathways on the bottom floor of the containment, the debris will not clog these pathways. As a result of evaluation, no choke points that may block the flow paths of return water are identified. Therefore, only the hold-up volumes may challenge the minimum water level of the IRWST.

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The WCAP-16530-NP-A (Reference 9) referenced in NRC RG 1.82 (Reference 3) provides a conservative model to predict the corrosion and dissolution of containment materials in a post-LOCA environment and the formation of chemical precipitates for participating PWRs. The primary corrosion products contributing to these chemical precipitates are calcium, silicon, and aluminum, and the precipitates can form aluminum oxy-hydroxide, calcium phosphate, and sodium aluminum silicate. In addition, use of aluminum is described in Subsection 6.1.1.2.1.

Representative materials being input to the spreadsheet of WCAP-16530-NP-A (Reference 9) for producing the chemical precipitates are aluminum and concrete. Inputs for aluminum and concrete are conservatively considered to maximize the material release rates and chemical precipitates. The amounts of aluminum is assumed as actual amounts for all equipment plus margin. The concrete surface area is calculated using 10D ZOI ~~instead of 4D~~. Detailed information is provided in Subsection 3.8.3 of Reference 4 and these amounts are programmatically controlled as described in Subsection 6.8.4.5.10.

The final precipitates produced from the spreadsheet of WCAP-16530-NP-A (Reference 9) are based on the reactive material surface areas and quantities, temperature, water level, pH, and other parameters related to the plant environment and post-accident evolution. Results are listed in Table 6.8-3.

Surrogate suspensions of chemical precipitates representing this chemical debris can be included as an additional debris source to the strainer testing program to qualify the strainer for chemical effects.

to maximize concrete quantity for conservatism even though all concrete surface area is qualified coated.