SUMMARY AUDIT REPORT OF APR1400 DESIGN SPECIFICATIONS

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1.0 BACKGROUND

Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, Section 47, "Contents of applications; technical information," states that:

> The application must contain a level of design information sufficient to enable the Commission to judge the applicant's proposed means of assuring that construction conforms to the design and to reach a final conclusion on all safety questions associated with the design before the certification is granted. The information submitted for a design certification must include performance requirements and design information sufficiently detailed to permit the preparation of acceptance and inspection requirements by the [U. S. Nuclear Regulatory Commission] NRC, and procurement specifications and construction and installation specifications by an applicant. The Commission will require, before design certification, that information normally contained in certain procurement specifications and construction and installation specifications be completed and available for audit if the information is necessary for the Commission to make its safety determination.

In conducting the review of the APR1400 DC application, the NRC staff requested that the applicant make available, the design and procurement specifications, as well as design documentation of equipment seismic qualification and component quality group classification (e.g., piping and instrumentation diagrams (P&IDs) and equipment classification documents) for the NRC staff to confirm the implementation of the provisions in the APR1400 design control document (DCD) for the design and qualification of these components.

In the NRC Standard Review Plan (SRP) Section 3.9.3, "ASME Code Class 1, 2, and 3 Components and Component Supports, and Core Support Structures," Section 7 of Appendix A provides guidance that the staff may request the submission of the Code-required design documents (such as design specifications, design reports, load capacity data sheets, or other related material or portion thereof), in order to establish that the design criteria, analytical methods, and functional capability satisfy the guidance provided by SRP Section 3.9.3. This includes verification that the design information described in the DCD was adequately translated into documentation for each of the

components designed to ASME *Boiler and Pressure Vessel Code* (BPV Code), Section III, Class 1, 2, and 3 requirements.

In addition, the NRC staff audited the design, equipment qualification, and procurement specifications for selected components in support of its reviews of the following SRP sections:

- Section 3.2.1, "Seismic Classification."
- Section 3.2.2, "System Quality Group Classification."
- Section 3.9.6, "Functional Design, Qualification, and Inservice Testing Programs for Pumps, Valves, and Dynamic Restraints."
- Section 3.10, "Seismic and Dynamic Qualification of Mechanical and Electrical Equipment."
- Section 3.11, "Environmental Qualification of Mechanical and Electrical Equipment."

The NRC staff provided KHNP with the audit plan to facilitate the audit, as documented in the Agencywide Documents Access and Management System (ADAMS) under Accession Number ML15222B259.

At the NRC office in Rockville, Maryland, from August 24, 2015, through August 27, 2015, staff members from the Mechanical Engineering Branch (MEB) of the Division of Engineering in the NRC Office of New Reactors (NRO) conducted a regulatory audit of APR1400 design and procurement specifications for ASME Code components, including valves, pumps, component supports, dynamic restraints, equipment seismic qualifications, and component classifications. The NRC staff followed the NRO Office Instruction NRO-REG-108 (Revision 0), "Regulatory Audits," in performing the audit of the APR1400 design and procurement specifications. During this audit, the NRC staff reviewed individual design and procurement specifications for ASME Code components, including valves, pumps, component supports, dynamic restraints, equipment seismic qualifications and component classifications, as listed in this audit report.

2.0 AUDIT RESULTS

In general, the NRC staff found that the design and procurement specifications incorporated the provisions specified in the APR1400 DCD, and addressed component operating experience. However, several design specifications for pumps, valves, and dynamic restraints in the APR1400 nuclear steam supply system (NSSS) should be revised to incorporate the audit findings. In addition, design specifications (or information typically included in specifications) for a sample of safety-related pumps and valves in balance of plant (BOP) systems in the APR1400 need to be made available for a follow-up audit, such that the staff can reach a conclusion regarding the specification-related provision in 10 CFR 52.47. The specific list of sampled pumps and valves is provided in the table attached to this audit report. KHNP stated that the supporting documents to show the interfaces between the specifications and design documents will be made available for the NRC staff's review. The NRC staff will maintain this topic as an open item for the review of the qualification information for the sampled BOP pumps and valves during the follow-up audit.

The staff also made a general observation related to the application of APR1400-specific codes and standards for specific components. In its response to questions on several specifications, KHNP stated that the procurement specifications provided for this audit were prepared for the reference plant (Shin-Kori NPP Units 3 & 4), which has different codes and standards commitments than the APR1400. KHNP stated that a design summary will be provided that specifies the current APR1400 code and standards, and that a COL item will be included in the APR1400 DCD for the COL applicant to prepare final specifications that use the APR1400 codes and standards. This overall approach is acceptable to the NRC staff, in that it will provide information typically included in specifications for the APR1400 components, even though the specifications themselves may not be finalized. **The NRC staff will maintain all related audit questions as open items** for the review of the design summary and the COL item during the follow-up audit.

The attached Table 1 of this report, lists the detailed audit findings and planned resolution by the APR1400 design certification applicant. For those items identified as "Confirmatory" in the attached table, the NRC staff will verify that the planned changes to the design specifications have been incorporated during a follow-up audit of the APR1400 design specifications. In the following paragraphs, the staff discusses significant observations from the audit that are identified as Open or Closed in the attached Table 1. Some of the open items involve additional activities to be performed by KHNP; in other cases, KHNP provided references to already-available information that would address the staff's concern, but the duration of the audit was not sufficient to review the information. These open items will be addressed during a follow-up audit in early 2016.

2.1 ASME BPV Code Components and Component Supports

In general, the design and procurement specifications meet ASME BPV Code, Section III, NCA-3250 requirements. The NRC staff found that the design and procurement specifications have incorporated the provisions specified in the APR1400 DCD. However, the NRC staff has audit observations as listed in the attached Table 1. Based on the NRC staff observations, the audit items are considered Closed, Opened, or Confirmatory items, as listed in the attached Table 1. The applicant committed to update its documentation to incorporate the NRC staff's observations; the revised documents can be audited in a follow-up audit. Highlights from the NRC staff observations and the planned resolution are discussed below.

Design Specification 9-431-Z-S-404-10, "Design Specification for Reactor Vessel Assembly," Revision 03, dated May 26, 2015

a. In Section 3.1.1.1, the applicant referenced ASME BPV Code Section III 2007 edition with 2008 addenda to be used in APR1400 design. However, Section 3.1.2.1 referenced ASME B16.5 "Pipe Flanges and Flanged Fittings," 2009 edition. The NRC staff asked the applicant to provide a clarification whether the ASME B16.5 2009 edition was used in lieu of the ASME BPV Code Section III 2007 edition. In its response to the audit question, the applicant stated that there is a flange at the end of the vent pipe. This flange is designed to ASME B16.5 and, therefore, both ASME BPV Code Section III and ASME B16.5 are

referenced in Section 3.1.2.1. The applicant's response addressed the staff's question; therefore, this audit item is closed.

b. In Section 5.2.1.2, the applicant stated that the maximum allowable load criteria are defined in terms of axial (Fa), shear (Fv), moment (Mb), and torsional (Mt) loadings at the nozzles end based on a maximum allowable stress of 10 percent of yield for ASME Class 1 components at the critical section where the nozzle is welded to the component. The staff requested the applicant to provide a justification for the 10-percent criterion. In its response to the staff's question, the applicant stated that the criterion is an engineering judgment. It is impossible to have no piping reactions in partial penetration nozzles such as sampling and instrumentation nozzles. To control the piping loads in partial penetration nozzles, the system designer uses the criterion of 10 percent of yield strength.

   The staff noted that these partial penetration nozzles have nozzle ends that attach to an instrument, which would be considered as a free end of a cantilever beam. Therefore, the use of criterion of 10 percent of yield strength for a typical sampling and instrument nozzle design would be conservative. The staff observed that the sustained pressure load and weights of certain attached components could impose more significant loading at the nozzle end, such that the 10-percent criterion may not be appropriate. The staff requested the applicant provided the stress analysis of these nozzles during a follow-up audit to address the staff's question. **Therefore, this audit item remains open**.

c. In reviews of Table 4, it was unclear whether dynamic system loadings and loss-of-coolant accident (LOCA) loads were included. The applicant clarified how potential dynamic loads from the reactor coolant gas vent system and branch line pipe break loads (for lines not covered by leak-before-break (LBB) analyses) were included in service levels B and D. The staff verified that this information was consistent with the DCD and closed this audit item.

Design Specification 9-431-Z-S-404-20, "Design Specification for Pressurizer Assembly," Revision 02, dated May 29, 2015

a. The NRC staff observed that Section 6.5.1 of Design Specification 9-431-Z-S-404-20 specified the loads to be used in the stress analysis of the pressurizer. However, there is no description and definition of the loads, particularly the loads listed in Tables 4, 5, 7 and 8. The applicant indicated that the specification would be revised to describe the loads, and the staff could audit it in a follow-up audit. **This audit item remains open**.

Design Specification 9-431-Z-S-404-91, "Design Specification for Reactor Coolant Pumps," Revision 02, dated March 16, 2015

a. In Section 8.5.5.3, the applicant referred to pump coastdown curves that show the decay of speed and flow versus time. However, no coastdown curves were included or referenced in this specification.

In its response to the NRC staff's question, the applicant stated that the reactor coolant pump (RCP) coastdown curves mentioned in Section 8.5.5.2 are for a test loop and are for reference purpose only. The coastdown characteristics with test loop and with the actual plant loop are different from each other in terms of loop configuration and coolant inertia. The final verification of pump coastdown is performed at the site along with the reactor coolant system (RCS) flow rate verification tests during plant startup test described in DCD Tier 2 Subsection 14.2.12.2. The staff agrees that it is reasonable not to specify acceptance criteria for coastdown that are specific to a particular test loop in the design specification.

The applicant committed to delete Section 8.5.5.3 of this specification to avoid future confusion. This audit item is closed.

2.2 ASME Pumps, Valves, and Dynamic Restraints and Environmental Qualification

Design Specification 9-450-Z-S-404-11, "Design Specification for Pressurizer Pilot Operated Safety Relief Valves," Revision 2, dated March 27, 2015

a. In its response to an audit question regarding seismic qualification, KHNP stated that the design specification requirement for the single axis seismic load to be applied in a conservative manner includes the application along the least rigid axis. The NRC staff identified this audit question as a confirmatory item based on the KHNP plan to modify the pilot-operated safety relief valve (POSRV) design specification to clarify the application of the single axis seismic load for valve qualification. The same observation applies to other valve types as well.

b. In its response to an audit question regarding the provisions in the POSRV design specification related to the motor-operated valves (MOVs) in the POSRVs, KHNP provided responses to several specific aspects of MOV qualification. The NRC staff will confirm the planned design specification changes listed in the table attached to this audit report during the follow-up audit. **The staff will maintain specific aspects of this audit question as open items** for review of the revised MOV design specification during the follow-up audit. The staff closed two items in this audit question based on the response by KHNP that the MOV periodic verification program and MOV instrumentation will be the responsibility of the utility. Therefore, the COL applicant will be responsible for describing the MOV testing operational program, including periodic verification of MOV capability and establishment of MOV instrumentation, in its COL application.

Design Specification 9-450-Z-S-404-00, "Design Specification for Check Valves Greater than Two Inches," Revision 4, dated August 19, 2015

a. In its response to an audit question regarding the types of check valves to be used in the APR1400 design, KHNP indicated that the APR1400 will only include

swing check valves and spring-loaded lift check valves that are within the scope of the design specification for NSSS check valves. The NRC staff closed this audit question based on this clarification of the check valve scope provided by KHNP.

b. In its response to an audit question regarding chemical and volume control system (CVCS) check valve CH-433, KHNP stated that this check valve is less than two inches in size, and is not included in the NSSS design specification. KHNP indicated that check valves less than two inches will be included in the BOP system procurement specifications. **The NRC staff will maintain this audit question as an open item** for the review of the qualification of small check valves that have significant safety-related functions during the follow-up audit.

Design Specification 9-450-Z-S-404-14, "Design Specification for Motor Operated Valves" Revision 3, dated August 19, 2015

a. In its response to an audit question regarding the design specification provision in Section 6.1.6 that the orientation of the valve stem shall be upright vertical, KHNP stated that the vendor will determine the proper motor and spring pack locations and limit switch compartment location. The NRC staff closed this audit question based on experience that the standard qualification of MOV orientation is accomplished with motor and spring pack horizontal locations, and the limit switch compartment located above the gear box. The MOV vendor will be expected to justify the qualification of the MOV for its intended orientation.

b. In its response to an audit question regarding the standards applied in the qualification of valve motor operators, KHNP indicated that Section 6.4.3.5 of the design specification requires the valve motor operator to be qualified in accordance with IEEE 382, "IEEE Standard for Qualification of Safety-Related Actuators for Nuclear Power Generating Stations," and Regulatory Guide (RG) 1.73, "Qualification Tests for Safety Related Actuators in Nuclear Power Plants." KHNP stated that the motor operator shall also be evaluated for functional qualification of the valve assembly in accordance with ASME QME-1-2007, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants," as stated in Sections 6.4.3.2 and 6.4.9(a) of the design specification. The NRC staff accepts the use of ASME QME-1-2007 in RG 1.100 (Revision 3), "Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants." The NRC staff closed this audit question based on the clarification by KHNP of the standards to be applied for MOV qualification.

c. In its response to an audit question regarding the application of the Electric Power Research Institute (EPRI) MOV Performance Prediction Methodology (PPM), KHNP stated that the database package required by Section 6.4.15 of the design specification is used for preparing the input for the EPRI MOV PPM analysis, which will be performed by KHNP. **The NRC staff will maintain this**

audit question as an open item for the review of the revised MOV design specification during the follow-up audit.

d. In its response to an audit question regarding MOV sizing, KHNP stated that Section 6.4.19.2 of the design specification provides requirements for sizing of the MOV operator. KHNP indicated that the flow condition necessary to consider for valve sizing is specified in the valve data sheet. **The NRC staff will maintain this audit question as an open item** for the review of the revised MOV design specification during the follow-up audit.

e. In its response to an audit question regarding valve minimum thrust requirements in Section 6.4.19.32 of the design specification, KHNP stated that the valve minimum thrust for operator sizing is dependent on differential pressure. KHNP indicated that the flow condition necessary for valve sizing is provided in the data sheet. **The NRC staff will maintain this audit question as an open item** for the review of the revised MOV design specification during the follow-up audit.

f. In its response to an audit question regarding MOV periodic verification, KHNP stated that MOV periodic verification is not within the vendor's scope, but rather the utility. The NRC staff closed this audit question based on the responsibility of the COL applicant to describe the MOV testing operational program in its COL application, including the use of valves within the test scope of the Joint Owners' Group Program on MOV Periodic Verification.

g. In its response to an audit question on MOV instrumentation, KHNP stated that the determination of appropriate MOV instrumentation, such as stem strain gauges, is not within the scope of the vendor, but rather the utility. The NRC staff closed this audit question based on the responsibility of the COL applicant to describe the MOV instrumentation as part of the MOV testing operational program in its COL application.

h. In its response to an audit question regarding the potential impact of vibration on valve degradation and performance, KHNP stated that Section 6.3.1.1(d) of the design specification addresses the vibration effects in light of testing and operation of valves that might result in potential impact on valve degradation and performance. **The NRC staff will maintain this audit question as an open item** for the review of the revised MOV design specification during the follow-up audit.

Design Specification 9-450-Z-S-404-13, "Design Specification for Pneumatic Operated Valves," Revision 3, dated August 19, 2015

a. In its response to an audit question regarding qualification provisions (beyond testing) for pneumatic operated valves, KHNP stated that it would review and incorporate the requisite requirements for qualifying functional capability in accordance with ASME QME-1-2007, if applicable. **The NRC staff will maintain**

this audit question as an open item for the review of the design specification changes during the follow-up audit.

b. In its response to an audit question regarding valve instrumentation, KHNP stated that the determination of appropriate valve instrumentation, such as stem strain gauges, is not within the scope of the vendor, but rather the utility. The NRC staff closed this audit question based on the responsibility of the COL applicant to describe the valve instrumentation as part of the inservice testing (IST) operational program in its COL application.

Design Specification 9-450-Z-S-404-16, "Design Specification for Manual Valves" Revision 4, dated August 19, 2015

a. In its response to an audit question regarding the application of ASME QME-1-2007, KHNP stated its view that manual valves are not within the scope of ASME QME-1-2007. KHNP indicated that the functional capability of manual valves will be demonstrated by test in accordance with the approved testing procedure based on a method other than ASME QME-1-2007. During the audit, the NRC staff indicated to KHNP that RG 1.100 (Revision 3) specified that ASME QME-1-2007 may be applied to manual valves. KHNP clarified that functional qualification of manual valves will be demonstrated by testing required by the valve data sheet, including testing against flow conditions. **The staff will maintain this audit question as an open item** for the review of the applicant's planned process for qualification of manual valves during the follow-up audit.

b. In its response to an audit question regarding the design specification provision in Section 6.1.5 that the valve will be designed for suitable operation regardless of orientation, KHNP stated that the vendor will determine the orientation of manual valves for qualification. The NRC staff closed this audit question based on experience with valves and actuators for the qualification for proper orientation. The valve vendor will be expected to justify the qualification of the manual valves for the intended orientation.

c. In its response to an audit question regarding environmental qualification of nonmetallic parts, KHNP stated that manual valves do not contain any nonmetallic parts that are critical in performing the safety function. **The NRC staff will maintain this audit question as an open item** for the review of the use of nonmetallic parts in manual valves during the follow-up audit.

Design Specification 9-450-Z-S-404-19, "Design Specification for Miscellaneous Safety and Relief Valves," Revision 4, dated August 19, 2015

a. In its response to an audit question regarding application of IEEE 323, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations," and RG 1.89, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants," KHNP stated that the nonmetallic parts of the safety and relief valves are qualified in accordance with

ASME QME-1-2007, rather than IEEE 323. The NRC staff closed this audit question based on the clarification by KHNP of the qualification standard for nonmetallic parts of the safety and relief valves.

Design Specification 9-431-Z-S-404-A2, "Design Specification for Reactor Coolant Pump Hydraulic Snubbers" Revision 2, dated June 8, 2015

a. In its response to an audit question regarding a provision in Section 6.3.4.3 of the design specification that the snubber will remain functional for 24 months without maintenance, KHNP clarified that the RCP hydraulic snubbers shall maintain their function for more than the 18 month plant refueling cycle, and that its performance can be inspected and tested during each plant refueling outage. The NRC staff closed this audit question based on the responsibility of the COL applicant for an APR1400 to describe the inservice inspection (ISI) program for the RCP hydraulic snubbers, including their inspection at each refueling outage. This observation applies to multiple specifications where the inspection frequency of snubbers was referenced.

b. In its response to an audit question regarding the sections in the design specification that address qualification provisions (beyond testing) in ASME QME-1-2007, KHNP stated that these qualification provisions are specified in Sections 4.2.2, 4.2.3, 5.2, and 6.4.1 in the design specification and in Appendix A of the design specification, Sections 6.2 and 8.2. **The NRC staff will maintain this audit question as an open item** for review during the follow-up audit.

c. In its response to an audit question regarding the environmental qualification of the RCP hydraulic snubbers, KHNP stated that these provisions are specified in Sections 4.2.3 and 6.2 of the design specification. **The NRC staff will maintain this audit question as an open item** for review during the follow-up audit.

d. In its response to an audit question regarding the use of Neolube Number 1 as a lubricant for the RCP hydraulic snubbers, KHNP stated that Neolube Number 1 is acceptable for the RCP hydraulic snubbers because the environmental temperature will be maintained less than 400 degrees Fahrenheit (°F) (204 degrees Celcius (°C)) for all plant conditions, including accident conditions. The NRC staff closed this audit question based on the clarification by KHNP and the acceptability of Neolube Number 1 for use in this temperature regime. This observation applies to multiple specifications where the use of Neolube Number 1 was referenced.

Design Specification 9-431-Z-S-404-62, "Design Specification for Steam Generator Upper Support Snubber" Revision 2, dated June 2, 2015

a. In its response to an audit question regarding the sections in the design specification that address qualification provisions (beyond testing) in ASME QME-1-2007, KHNP stated that these qualification provisions are specified in Sections 4.2.2, 4.2.3, 5.2, and 6.4.1 in the design specification and in Sections

3.5 and 8.2 of its Appendix A. **The NRC staff will maintain this audit question as an open item** for review during the follow-up audit.

b. In its response to an audit question regarding the environmental qualification of the Steam Generator Upper Support snubbers, KHNP stated that these provisions are specified in Sections 4.2.3 and 6.2 of the design specification. **The NRC staff will maintain this audit question as an open item** for review during the follow-up audit.

Purchase Specification 9-184-J237A, "Main Steam Safety Valves" Revision 2, dated November 13, 2009

a. The NRC staff prepared three audit questions regarding the purchase specification for the main steam safety valves (MSSVs). In those questions, the staff requested that KHNP discuss the updated codes and standards to be applied to the MSSVs, whether more specific requirements had been prepared for the MSSVs, and where environmental qualification of the MSSVs is addressed. In a separate audit question, the staff requested that the design specification (or information typically included in design specifications) be made available for audit of the qualification of a sample MSSV. Therefore, **the staff will maintain the three audit questions on this purchase specification as open items** for review of the qualification of the sample MSSV during the follow-up audit.

Purchase Specification 9-521-M243, "Main Steam Isolation Valves and Main Feedwater Isolation Valves" Revision 2, dated July 22, 2009

a. The NRC staff prepared several audit questions regarding the purchase specification for the main steam isolation valves (MSIVs) and main feedwater isolation valves (MFIVs). In four of those questions, the staff requested that KHNP discuss the updated codes and standards to be applied, whether a specific actuator type had been selected, whether more specific requirements had been prepared, and where environmental qualification is addressed. In a separate audit question, the staff requested that the design specification (or information typically included in design specifications) be made available for audit of the qualification of a sample MSIV and MFIV. Therefore, **the staff will maintain the four audit questions on this purchase specification as open items** for review of the qualification of the sample MSIV and MFIV during the follow-up audit.

Purchase Specification 9-145-P206A), "Safety Related Steel Gate and Globe Valves with Actuator," Revision 2, dated September 19, 2008

a. In its response to an audit question regarding the reference to KEPIC MN Code in the purchase specification, KHNP stated that KEPIC is a translated version of the ASME Codes, and that there are no basic differences between the codes.

The NRC staff closed this audit question based on the clarification provided by KHNP.

b. In its response to an audit question regarding updating valve-specific design specifications based on this purchase specification, KHNP stated that the valve-specific design specifications should be updated per NRC comments by a COL applicant. The NRC staff will maintain this audit question as an open item for review during the follow-up audit, as it relates to the item on the design summary and COL item described above.

2.3 Environmental Qualification of Mechanical Equipment

Design Specification 9-441-Z-S-404-11, 'Design Specification for Safety Injection Pump' Revision 3, dated March 2, 2015

a. In its response to a question regarding qualification of the SI and CS system pumps in a post-LOCA environment, KHNP listed the design specification sections that describe pump qualification criteria. The NRC staff does not consider the criteria listed in the design specification to be consistent with DCD commitments for the qualification of the SI and CS system pumps. KHNP understood the concern and plans to address this issue in a revision to the specification. **The NRC staff will maintain this topic as an open item** that will be reviewed during the follow-up audit.

b. In its response to a question regarding water chemistry requirement for the qualification of the SI and CS system pumps in a post-LOCA environment, KHNP indicated that Section 7.2 of the design specification is the water chemistry during normal operation. KHNP also listed other sections of the design specification that require pump testing for post-LOCA conditions. The NRC staff does not consider the criteria listed in the design specification to be consistent with DCD commitments for the qualification of the SI and CS system pumps. **The NRC staff will maintain this topic as an open item** that will be reviewed during the follow-up audit.

Design Specification 9-451-Z-S-404-31, "Design Specification for Centrifugal Charging Pump" Revision 2, dated March 2, 2015

a. In its response to a question regarding ASME QME-1-2007 testing of the centrifugal charging pumps, KHNP indicated that the pumps do not perform an active safety-related function and are not qualified as active mechanical equipment in accordance with ASME QME-1-2007. The NRC staff determined that this response was consistent with the typical scope of ASME QME-1-2007, and this audit question is therefore closed.

2.4 Seismic and Dynamic Qualification of Mechanical and Electrical Equipment

APR1400 126 Appendix 4I, "Dynamic Qualification Requirements for Nuclear Safety-Related Equipment," Revision 2, dated December 2006

a. In its response to an audit question regarding the scope of the dynamic qualification of program described in Appendix 4I being different from that described in SRP Section 3.10, KHNP stated that the response will be provided as part of the response to RAI 81-800, Question 03.10-4 related to a similar issue for the DCD and Technical Report APR1400-E-X-NR-14001-P, "Equipment Qualification Program." **The staff will maintain this audit question as an open item** for review in a follow-up audit.

b. In its response to an audit question regarding the information from ASME QME-1-2007, Section QR-A8300, "Qualification Report," to be included in the qualification report, KHNP indicated that active mechanical equipment qualification follows the provisions in ASME QME-1-2007, but that it is not necessary to specify that the qualification report format must follow QME-1-2007. The NRC staff noted that APR1400 Purchase Specification 9-145-P206C, "Safety Related Controlled Closure Check Valves," Revision 2, Section 4.05.C.4 states "For Active Valves, Supplier shall prove by test and/or analysis the operability of the valves before, during, and after design basis accidents and provide test or analysis report. The results may be furnished as a part of dynamic qualification report in accordance with the requirements of Appendix 4I." These statements indicate that Appendix 4I of the purchase specifications provides the provisions for dynamic qualifications of active mechanical equipment. Therefore, the NRC staff determined that Appendix 4I should follow the ASME QME-1 qualification report provisions and list ASME QME-1-2007 as a reference. **This action is being tracked as an open item** for review in a follow-up audit.

2.5 Equipment Classifications and Quality Groups

Design Specification 9-728-Z-S-404-22, "Design Specification for Heated Junction Thermocouple [HJTC] Probe Assembly," Revision 2, dated February 11, 2015

a. In its response to an audit question regarding the safety classification of HJTC components and seal plug, KHNP stated that Table 3.2-1 of the DCD will be revised to match the safety classifications of the design specification. The NRC staff will track this audit question as a confirmatory item to ensure the DCD changes KHNP has committed to are made.

DOCUMENTS REVIEWED

- Design Specification 9-431-Z-S-404-C0, "Design Specification for the Integrated Head Assembly," Revision 02, dated May 15, 2015.

- Design Specification 9-431-Z-S-404-10, "Design Specification for Reactor Vessel Assembly," Revision 03, dated May 26, 2015.

- Design Specification 9-431-Z-S-404-30, “Design Specification for RTD Thermowells,” Revision 02, dated July 29,-2015.
- Design Specification 9-431-Z-S-404-20, “Design Specification for PR Assembly,” Revision 02, dated May 29, 2015.
- Design Specification 9-450-Z-S-404-11, “Design Specification for Pressurizer Pilot Operated Safety Valves,” Revision 02, dated March 04, 2015.
- Design Specification 9-431-Z-S-404-91, “Design Specification for Reactor Coolant Pumps,” Revision 02, dated March 16, 2015.
- Design Specification 9-431-Z-S-404-40, “Design Specification for Steam Generator,” Revision 03.
- Document No. 94/2Z-S-490-20, “Design Data for the Hydraulic Loads on Reactor Internals during Normal Operation,” Revision 01, dated September 12, 2013.
- Purchase Specification 9-447-N206, “IRWST Sump Strainers,” Revision 1, dated August 27, 2009.
- Purchase Specification 9-135-M231, “Safety Related Strainers,” Revision 01, dated September 18, 2008.
- Design Specification 9-441-Z-S-404-32, “Design Specification for Shutdown Cooling Pump Miniflow Heat Exchanger,” Revision 03, dated February 25, 2015.
- Design Specification 9-451-Z-S-404-41, “Design Specification for Volume Control Tank.”
- Design Specification 9-412-Z-S-404-10, “Design Specification for Reactor Vessel Core Support and Internal Structures,” Revision 02, dated May 07, 2015.
- Design Specification 9-410-Z-S-404-11, “Design Specification for Control Element Drive Mechanisms and CEA Extension Shaft,” Revision 03, dated May 26, 2015.
- Design Specification 9-159-M273, “Flow Restriction Elements and Venturies,” Revision 2, dated October 15, 2008.
- Purchase Specification 9-133-N204, “Safety Related Heat Exchangers,” Revision 2.
- Design Specification 9-144-P202A, “Safety Related Shop Fabricated Piping,” Revision 2, dated October 22, 2008.
- Design Specification 9-145-P207, “Safety & Non-Safety Related Manual Steel Gate, Globe & Check Valves, 2” and Smaller,” Revision 1, dated February 27, 2008.

- Design Specification 9-147-C215A, “Safety Related Shop Fabricated Pipe Supports,” Revision 2, dated April 11, 2008.

- Design Specification 1-521-M407-001, “PSDS-Main Steam System,” Revision 0, dates June 26, 2015.

- Design Specification 1-037-N407-001, “Piping System Design Specification for General,” Revision 1, dated December 29, 2014.

- Design Specification 1-431-N407-001, “Reactor Coolant System (RC),” Revision 0, dated February 28, 2012.

- Design Specification 1-441-N407-001, “Safety Injection/Shutdown Cooling System (SI),” Revision 1, dated December 30, 2014.

- Design Specification 1-451-N407-001, “Chemical and Volume Control System (CV),” Revision 0, dated February 28, 2012.

- Design Specification 9-451-Z-S-404-72, “Design Specification for Letdown Heat Exchanger,” Revision 2, dated March 02, 2015.

- Design Specification 9-451-Z-S-404-50, “Design Specification for Orifices,” Revision 1, dated March 03, 2015.

- Design Specification 9-431-Z-S-404-80, “Design Spec for Reactor Coolant Pipe and Fittings,” dated June 01, 2015.

- Design Specification 9-728-Z-S-404-22, “Design Specification for Heated Junction Thermocouple Probe Assemblies,” Revision 2, dated February 25, 2015.

- Design Specification 9-431-Z-S-404-A1, “Design Specification for Reactor Coolant Pump Supports,” Revision 2, dated May 19, 2015.

- Purchase Specification Appendix 4I, “Dynamic Qualification Requirements for Nuclear Safety-Related Equipment,” Revision 2, dated December 2006.

- Purchase Specification 9-145-P206C, “Safety Related Controlled Closure Check Valves,” Revision 2, dated January 24, 2008.

- Purchase Specification 9-521-M243, “Main Steam Isolation Valves and Main Feedwater Isolation Valves,” Revision 2, dated July 22, 2009.

- Design Specification 9-441-Z-S-404-11, ”Design Specification for Safety Injection Pump,” Revision 3, dated March 02, 2015.

3.0 CONCLUSION

Based on the audit, the NRC staff has the following conclusions:

1) The NRC staff concludes that KHNP is developing design and procurement specifications for ASME Class 1, 2, and 3 components, component supports, and core support structures that meet the ASME BPV Code, Section III, NCA-3250 requirements and are consistent with the methodology and criteria described in the APR1400 DCD Tier 1 and 2.

2) The NRC staff concludes that KHNP is developing design and procurement specifications for pumps, valves, and dynamic restraints, and equipment qualification that are consistent with the provisions in the APR1400 DCD Tier 1 and 2.

3) The NRC staff concludes that the equipment classifications are consistent with the APR1400 DCD and regulatory guidance.

KHNP indicated that the items reviewed during this audit will be addressed in revising the design and procurement specifications for follow-up review by the NRC staff. The NRC staff will conduct a follow-up audit of the revised design and procurement specifications when KHNP notifies the NRC staff that the revised specifications are available.

Table 1: Audit Observations - ASME Class 1, 2, and 3 Components, Component Supports, and Core Support Structures

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
Document No. 9-441-Z-S-404-11, Design Specification for Safety Injection Pump					
1	Section 4.2.3.1, SE and CS Pump Evaluations," of Technical Report APR1400-E-N-NR-14001-P, "Design Features to Address GSI-191," Rev. 0 dated December 2014 states, "[T]he SI and CS pumps and associated mechanical seals will be qualified to operate with the post-LOCA fluids for at least 30 days, using the qualification guidance of ASME QME-1-2007 endorsed by RG1.100 Revision 3. As part of the qualification process, the pump vendor, at a minimum, will fulfill the following pump criteria." The technical report lists specific test criteria to be performed by the pump vendor. Why doesn't the SI pump design specification list the qualification criteria specified in Section 4.2.3.1 of the technical report?	Strnisha	The pump qualification criteria of Test Report (APR1400-E-N-NR-14001-P, Section 4.2.3.1) are described in the design specification. The criteria for SI pump are described in the following sections: Section 6.2.2 (performance requirements), 6.4.1.9 (mechanical evaluation (vibration)), 6.4.4.2 (mechanical shaft seal assembly), 6.5.2 (pump operability) and 7.1.6 (hydraulic performance).	1. The qualification process should include pump testing for both normal and post-LOCA operating conditions. 2. The specification should be revised as follows to specify post-LOCA testing: The SI and CS pumps and associated mechanical seals shall be qualified by test or a combination of test and analysis to operate with post-LOCA fluids for at least 30 days in accordance with ASME QME-1-2007 accepted by RG1.100 Revision 3. 3. The specification should be revised to specify the additional qualification criteria to be provided by the vendor: As part of the QME-1 qualification process, the vendor will provide the pump criteria as described in Section 4.2.3.1, "SE and CS Pump Evaluations," of Technical Report APR1400-E-N-NR-14001-P, "Design Features to Address GSI-191."	**Open**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
				Staff Note: The design specification sections listed in the response do not meet QME-1 and DCD commitments for qualification testing of the pumps in post-LOCA conditions.	
2	Section 7.2, "Water Chemistry Requirements," of the SI pump design specification states that, "The pumps shall operate satisfactorily while handling water of dissolved chemistry as shown below. A small percentage of foreign particles may be present in the pumped fluid during long term operation. The limit of foreign particle size is assured by a vertical screen with a 0.090 inch clear opening in the in-containment refueling water storage tank." This section of the specification also describes the suspended solids as "0-2.0 ppm with a particle size < 0.09 inch diameter)." However, this does not appear to be consistent with the post-LOCA fluids constituents as described in Section 4.2.2.4, "Post-LOCA Fluid Constituents," and Table 4.2.5, "Post-LOCA Fluid constituents Downstream of IRWST Sump Strainer," of Technical Report APR1400-E-N-NR-14001-P. Technical report states the strainer hole size as 0.094 inch and the total post-LOCA debris concentration as 235.6 ppm. Why doesn't the SI pump design specification describe the post-LOCA fluids constituents as specified in technical report?	Strnisha	Document alignment pertaining to the strainer hole size needs to be investigated and an RAI to complete this is requested. Section 7.2 of the SI pump design specification is for ensuring acceptability during normal operating conditions. Design specification (9-441-Z-S-404-11) for the SI pump currently describes several requirements to resolve GSI-191, including: hydraulic performance (Section 7.1.6), mechanical shaft seal assembly (Section 6.4.4.2), and pump mechanical evaluation (vibration) (Section 6.4.1.9). Additional post-LOCA condition requirements for the SI pumps do not appear necessary.	1. Technical Report APR1400-E-N-NR-14001-P specifies a strainer hole size 0.094 inches. The specification is not consistent with the technical report. KHNP is to resolve this inconsistency. No RAI will be issued. 2. The specification should be revised as follows to clarify the debris loading: For GSI-191 testing, the pumps shall be qualified to operate for at least 30 days with the debris loading specified in Table 4.2.5, "Post-LOCA Fluid constituents Downstream of IRWST Sump Strainer," of Technical Report APR1400-E-N-NR-14001-P. Staff Note: The design specification sections listed	**Open**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
				in the response do not meet QME-1 and DCD commitments for qualification testing.	
3	APR1400 DCD Section 3.11, Environmental Qualification of Mechanical and Electrical Equipment," states the qualification of nonmetallic parts in mechanical equipment such as pumps (including mechanical seals), valves and dynamic restraints is performed by test or a combination of test and analysis in accordance with Appendix QR-B, "Guide for Qualification of Nonmetallic Parts," of ASME QME-1-2007 as accepted by RG 1.100 (Revision 3). Appendix QR-B of ASME QME-1-2007 also includes documentation requirements for the nonmetallics. Why doesn't the SI pump design specification describe the environmental qualification of nonmetallic parts as specified in the APR1400 DCD?	Strnisha	Section 6.5.2 states that the equipment shall be qualified in accordance with ASME QME-1-2007. The requirement will be added as follows; "The nonmetallic parts which are critical in performing the safety function shall be environmentally qualified in accordance with QR-B of ASME QME-1-2007."	Specification to be revised by December 31, 2015 1. The specification should be revised to state the following: "The nonmetallic parts shall be environmentally qualified by test or a combination of test and analysis in accordance with QR-B of ASME QME-1-2007 as accepted by RG 1.100 Revision 3." Staff note: Delete "which are critical in performing the safety function" because Appendix QR-B specifies when qualification testing is not required and the evaluation and documentation necessary leading to their exclusion.	**Confirmatory**
4	Why does Appendix F, "Acceptable Lubricants," in Specification 9-441-Z-S-404-11 list Neolube Number 1 when this lubricant is unacceptable for high temperature applications? This question should apply to all pump, valve, and dynamic restraint specifications.	Strnisha	It will be noted in the design specification Appendix F that Neolube 1260 should be used for high temperature applications.	Specification to be revised by December 31, 2015	**Confirmatory**
5	Safety Injection Pump Data Sheet in Design Specification 9-441-Z-S-404-11 lists the NPSH Available (including	Strnisha	It is requested that an RAI be issued to address the SI	1. NRC staff will issue an RAI to address uncertainties	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	bypass) to be 20 feet at runout flow. Table 3.6-1, "$NPSR_r$ for SI pump and CS Pump," of Technical Report APR1400-E-N-NR-14001-P, "Design Features to Address GSI-191," describe provisions for determining uncertainties associated with $NPSH_r$. Do the design and procurement specifications for the SI and CS pumps consider NPSH uncertainties? Are uncertainties associated with $NPSH_r$ considered for all safety-related pumps?		pump NPSHr uncertainty. The APR1400 procurement specification of CS pump will be prepared at the stage of COL application and the COL applicant is to consider the $NPSH_r$ uncertainties in the procurement specification.	associated with $NPSH_r$ for safety related pumps other than SI and CS. Note: Uncertainties for SI and CS pumps are addressed in Tables 3.6-1 and 3.6-2 of TR APR1400-E-N-NR-14001-P. Verify that the procurement specifications for SI and CS pumps are consistent with these tables. 2. Specification to be revised by December 31, 2015	
6	Section 4.2.3.2.2 "Wear Rate Evaluation for Valves, Orifices and Pipes," of Technical Report APR1400-E-N-NR-14001-P, "Design Features to Address GSI-191, states that, "[T]he wear rate of SI and CSS valves [included in the flowpath during an LBLOCA] will be provided by the vendor. The vendor will qualify the SI and CSS valves to operate with the post-LOCA fluids for at least 30 days, in accordance with ASME QME-1-2007 endorsed by RG 1.100 Revision 3. As part of the qualification process, the vendor will provide data and/or analysis to support acceptable wear rates during operation in post-LOCA fluids at the associated flow velocities listed in Table 4.2-6. Vendor(s) will also provide tests and/or analyses to support acceptable wear rates of pipes and orifices. For conservatism, vendors will perform component wear evaluations at the assumed flowrates/velocities." Do the applicable design and procurement specifications contain that above information for SI and CS valves,	Strnisha	The APR1400 procurement specifications of the CS valves, orifices, and pipes will be prepared at the stage of COL application. The COL applicant is to incorporate the requirements into the procurement specifications for the vendors to provide data related wear rate, and to perform tests and/or evaluations to support acceptable wear rates of the CS valves, orifices, and pipes. The design specification for the SI valves will incorporate the wear rate evaluation in accordance	Specification to be revised by December 31, 2015	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	orifices, and pipes?		with WCAP-16406 as accepted by NRC.		
7	Section 4.2.3.3.2 “Heat Exchanger Performance and Wear,” of Technical Report APR1400-E-N-NR-14001-P, “Design Features to Address GSI-191, states that the vendor will provide test and/or analysis to confirm that the heat exchanger tube material will not degrade significantly (i.e., “eroded” tube thickness > minimum tube thickness required to retain pressure) in post-LOCA fluid over the 30 day mission time. Do the applicable design and procurement specifications contain that above information for the CS heat exchangers?	Strnisha	The APR1400 procurement specifications of CS Hx. will be prepared at the stage of COL application. The COL applicant is to incorporate the requirements into the procurement specifications for the vendor.	Specification to be revised by December 31, 2015	**Confirmatory**
8	Section 8.3.7 of Design Specification 9-441-Z-S-404-12 for the Shutdown Cooling Pump states that the functional qualification shall be demonstrated in accordance with Reference 3.3.3 (ASME QME-1). However, the staff approved methodology for <u>functional qualification</u> of pumps is by test or a combination of test and analysis in accordance with ASME QME-1. All applicable pump design and procurement specifications should be revised to clarify the functional qualification shall be performed by test or a combination of test and analysis in accordance with ASME QME-1.	Strnisha	The shutdown cooling pump design specification will be revised to clarify functional qualification which is to be demonstrated by test or a combination of test and analysis in accordance with ASME QME-1 in accordance with the NRC comment.	Specification to be revised by December 31, 2015	**Confirmatory**
9	Section 3.2.1 of Design Specification Appendix 4F for the Environmental Qualification Requirements for Nuclear Safety-Related Equipment states the qualification of the equipment shall be achieved by testing, analysis, including similarity or a combination of both. However, the staff approved methodology for <u>environmental qualification</u> of nonmetallic parts of mechanical equipment is by test or a combination of test and analysis. The EQ and other applicable specifications should be	Strnisha	The NSSS safety related equipment shall be qualified in accordance with ASME QME-1-2007. In addition, non-metallic parts are to be qualified in accordance with Appendix QR-B of ASME QME-1-2007 which will be added to the design specification,	Specification to be revised by December 31, 2015. The specification should be revised to state the following : 1. The NSSS safety related mechanical equipment shall be qualified by test or a combination of test and analysis in accordance with	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	revise to clarify that environmental the qualification of nonmetallic parts in mechanical equipment such as pumps (including mechanical seals), valves and dynamic restraints is performed by test or a combination of test and analysis in accordance with Appendix QR-B, "Guide for Qualification of Nonmetallic Parts," of ASME QME-1-2007 as accepted by RG 1.100 (Revision 3).		where applicable.	ASME QME-1-2007 accepted by RG1.100 Revision 3. 2. Non-metallic parts of mechanical equipment shall be qualified by test or a combination of test and analysis in accordance with Appendix QR-B of ASME QME-1-2007 accepted by RG1.100 Revision 3.	
10	The scope of Design Specification Appendix 4F for the Environmental Qualification Requirements for Nuclear Safety-Related Equipment includes active safety-related mechanical equipment in a harsh environment. However, mechanical equipment located in a mild environment may be subject to severe internal service conditions. What methodology is used to ensure that nonmetallic parts of safety-related mechanical equipment located in a mild environment will perform their safety related function?	Strnisha	The non-metallic parts of NSSS safety related mechanical equipment located in a mild environmental shall be qualified in accordance with ASME QME-1-2007. In addition, non-metallic parts are to be qualified in accordance with Appendix QR-B of ASME QME-1-2007 and will be added to the design specification, where applicable.	Specification to be revised by December 31, 2015 1. The specification should be revised as follows: The nonmetallic parts of NSSS safety related mechanical equipment located in harsh or mild environments shall be qualified by test or a combination of test and analysis in accordance with Appendix QR-B of ASME QME-1-2007 accepted by RG1.100 Revision 3.	**Confirmatory**
11	Applicable design and procurement specifications should be revised to incorporate RAI responses and the provisions for design, qualification (functional & environmental) and inservice testing as described in APR1400 DCD sections 3.9.6 and 3.11 and Technical Reports APR1400-E-N-NR-14001-P, "Design Features to	Strnisha	Design and procurement specifications will be revised to incorporate RAI response, where applicable.	Specification to be revised by December 31, 2015	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	Address GSI-191," and APR1400-E-X-NR-14001-P, "Equipment Qualification Program."				
12	RG 1.100, Revision 3, states that ASME QME-1-2007 is an NRC staff approved methodology for the qualification of pumps and valves, and when a licensee commits to the use of QME-1-2007 (including Appendices) for qualification of pumps, valves, and dynamic restraints, the criteria and procedures become part of the basis for the qualification program. The applicable design and procurement specifications reference RG 1.100, however, based on past experience, vendor qualification programs have not included all testing, inspection and documentation provisions in QME-1-2007. Will the design and procurement specifications include clarification that the criteria and procedures in ASME QME-1-2007 (including Appendices) become part of the basis for the qualification programs?	Strnisha	The functional qualification of pumps, valves, and dynamic restraints will be required in accordance with ASME QME-1. It is believed that this level detail design is within the vendor's scope to determine and in specifying an undesirable details in the specification may cause unnecessary limitations.	Staff will confirm that specifications reference RG 1.100 Revision 3.	**Confirmatory**
13	Section 8.2.10 of Design Specification 9-451-Z-S-404-31 for the centrifugal charging pumps states that test methods, definitions, and reporting of test results shall be in accordance with references 3.3.6 (IEEE 112-2004), 3.3.8 (NEMA MG-1-2009) and 3.3.13(ANSI/HI) Pump Standards). The specification does not appear to reference ASME QME-1-2007 for functional qualification of the pumps. Is functional qualification of the centrifugal charging pumps performed in accordance with the staff approved methodology in ASME QME-1 2007? If not, explain the qualification methodology that will be used.	Strnisha	ASME QME-1 describes the requirement and guidelines for qualifying active mechanical equipment. However, the centrifugal charging pumps do not perform a safety function so are not classified as active components according to the definition of active pumps described in APR1400 DCD section 3.9.3.3.1.	As stated by KHNP in the response, the pumps do not perform a safety function. Therefore, QME-1-2007 testing is not required. Pumps will be tested using the described references.	**Close**
14	All applicable design and procurement specifications for pumps, valves, heat exchangers, EQ, etc., should be	Strnisha	All applicable design specifications will be	Specifications to be revised by December 31, 2015	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	reviewed and revised to incorporate comments 1 – 13 above.		revised to incorporate the applicable comment resolution results of No. 1 to No. 13.		
15	Section 6.5.2 states that the pump and motor assembly shall be seismically qualified and certified for five (5) of ½ SSE and one (1) SSE in accordance with References 3.3.12 and 3.4.5 (in case of conflict, the most restrictive standard shall be applied). Reference 3.3.3 (ASME QME-1-2007) is for seismic qualification of active mechanical equipment, and should be included in the statement.	Wong	KHNP will include the ASME QME-1 for seismic qualification of active mechanical equipment in the design specification.	Specification to be revised by December 31, 2015	**Confirmatory**
16	Section 3.2 does not reference the OM Code. While Section 6.2.1 specifies that periodic testing shall be in accordance with Reference 3.2.2 (ASME BPV Code, Section XI). The OM Code should be referenced for periodic testing.	Scarbrough	KHNP will address the ASME OM for periodic testing of SI pumps in the design specification.	Specification to be revised by December 31, 2015	**Confirmatory**
Document No. 9-450-Z-S-404-11, Design Specification for Pressurizer Pilot Operated Safety Relief Valves					
1	Why does specification not reference NRC Regulatory Guide 1.100 (Revision 3) for the application of ASME Standard QME-1-2007?	Scarbrough	Reference to the RG will be incorporated into the specification.	Specification to be revised by December 31, 2015	**Confirmatory**
2	Why are IEEE 344 for seismic qualification, and NRC regulatory guides for various IEEE standards, not referenced (such as RG 1.73 for use of IEEE 382-2006 for environmental qualification)?	Scarbrough	IEEE 344 for seismic qualification is referenced in Section 3.1.10 of the Design Specification. The Design Specification will be revised to incorporate NRC Regulatory Guide 1.73 (Revision 1).	Specification to be revised by December 31, 2015	**Confirmatory**
3	Section 6.4.17.1 states that the safety-related function shall be qualified by “analysis and/or test.” Why does the specification not use the language in Paragraph QV-7100 of ASME QME-1-2007 that the Section QV provides for	Scarbrough	The wording will be revised and incorporated into the specification.	Specification to be revised by December 31, 2015	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	qualification of a valve assembly by a combination of testing and analysis?				
4	Section 6.4.20 states that the upper portion of the main valve shall not permit the disc to be mechanically locked in the closed position. Does this mean that the main valve will be designed to open directly from pressurizer pressure without pilot operation?	Scarbrough	No that is not the meaning. The main valve will be designed to open with the pilot operation. The requirement of this section means that the main valve will open automatically without the device mechanically locked. The controlled main valve is an indirectly acting pressure relief device. The main valve is own-medium-controlled and operates according to the relief principle. In the case of standard operating conditions the disc piston of the main valve is loaded by the own medium and pressed into a leak tight position. When the load is removed, the main valve opens. In order to control the relief, a control device is provided which consists of the pilot valves as well as measurement and control devices. When exceeding an inadmissible pressure, a pilot valve responds and	**Closed** for this audit, RAI might be prepared by separate NRC review group.	**Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			opens the control line to the main valve so that the pressure in the releasing chambers of the main valve will be decreased. In doing so, a pressure difference will be created at the disc piston of the main valve. The higher pressure below the disc piston opens the valve seat of the main valve towards the exhaust line. If the pilot valve blocks the control line again after a corresponding pressure decrease, the pressure in the releasing chambers of the main valve will build up again, and the main valve will close the exhaust line.		
5	Section 6.4.28 specifies motor operator requirements. The following questions apply to motor operator qualification: a. Why does Section 6.4.28.3 only specify "maximum differential pressure" for MOV sizing and not also flow conditions? b. Why does Section 6.4.28.6.2 specify the application of "limit switch and/or torque switch" because a limit switch will always be needed for position indication regardless of whether the MOV has a torque switch? c. Why does Section 6.4.28.7 state that the motor will stall upon failure of the limit or torque switch without specifying requirements for thermal overload protection? d. Why does Section 6.4.28.25 only specify valve	Scarbrough	a. Comment will be incorporated into specification. b. Agree with comment; however, it is necessary to provide the specification of the NEMA Type and the rating condition with the power in the requirements of this section. c. Comment will be incorporated into specification. d. The minimum valve	Specification to be revised by December 31, 2015 for items a, b, c, e, f, j, and k. Item d: Review during follow-up audit Item h: Review during follow-up audit	**Items a, b, c, e, f, j and k: Confirmatory** **Item d: Open** **Item g: Closed** **Item h: Open** **Item i: Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	minimum thrust requirements based on differential pressure load, stem rejection load, and packing load, when these loads do not address flow conditions (such as identified in the EPRI MOV Performance Prediction Program)? e. Why does Section 6.4.28 not address actuator requirements, such as degraded voltage, temperature effects, load sensitive behavior, and stem friction coefficient assumptions? f. Why does Section 6.4.28 not address any limitations for the use of magnesium rotors in motors? g. Why does Section 6.4.28 not address design provisions for periodic verification of design-basis capability, such as specifying the use of valves within the test scope of the Joint Owners Group Program for MOV Periodic Verification? h. Why does Section 6.4.28 not address design provisions for pressure locking and thermal binding? i. Why does Section 6.4.28 not address design requirements for valve instrumentation (such as stem strain gauges) for thrust and torque measurements to allow diagnostic testing? j. Why does Section 6.4.28 not specify that internal clearances, dimensions, and radii for the valve internals shall be inspected to verify that the valve will perform in a predictable manner, such as discussed in EPRI TR-106563, “Application Guide for Motor-Operated Valves in Nuclear Power Plants,” Volume 1, Revision 1: Gate and Globe Valves? k. Why does Section 6.4.28 not include “weak link” calculations with applicable conservative assumptions, such as 110% voltage and 0.1 stem friction coefficient?		thrust for operator sizing depends on the differential pressure not flow rate. The flow condition necessary for valve sizing is in the data sheet. It is understood that differential pressure is the sufficient information for calculating the minimum thrust requirements for operator sizing. See Comment Number 10 of MOV Specification. e. Comment will be incorporated into specification. f. Comment will be incorporated into specification. g. MOV periodic verification is not within the scope of the vendor, but is with the utility. Therefore, it is not necessary to address the periodic verification requirement in the design specification. See Comment Number 13 of MOV Specification. h. The design provisions for pressure locking and thermal binding are necessary for the gate valves. The POSRV valve type is not a gate valve.		

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			i. Instrumentation such as stem strain gauges is not within the scope of the vendor, but is with the utility. Therefore, it is not necessary to address the instrumentation for periodic verification in the design specification. See Comment Number 14 of MOV Specification. j. Comment will be incorporated into specification. k. Comment will be incorporated into specification.		
6	Section 6.5.1.2.2 states that a single axis seismic load may be applied in a "conservative manner." Why does this section not specify that the seismic load be applied along the least rigid axis (unless a more critical axis can be determined) consistent with ASME QME Case QME-007?	Scarbrough	Comment will be incorporated into specification.	Specification to be revised by December 31, 2015	**Confirmatory**
7	Why does Appendix B, "Valve Environmental Requirements," specify "not applicable" for vibration in light of testing and operating experience for safety relief valves that reveals potential impact of vibration on valve degradation and performance?	Scarbrough	The vibration parameter in this appendix considers the external environmental conditions excluding seismically induced mechanical stresses. The external vibration for the POSRVs comes only from the pressurizer because they are installed on the pressurizer and isolated		**Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			from other components. The pressurizer is installed in a system which may experience vibratory excitation generated by the reactor coolant pumps, however, the effect of pressurizer vibratory excitation is negligible on the POSRVs. Therefore, it is reasonable to state that the vibration is not applicable in Appendix B of the specification.		
8	Why does Appendix D, Table 1, "Acceptable Lubricants," list Neolube Number 1 when this lubricant is unacceptable for high temperature applications (whereas Neolube Number 1260 is specified by a supplier for reactor containment conditions)?	Scarbrough	Appendix D, Table 1 provides a list of various acceptable lubricants for the plant. Neolube Number 1 will be deleted in the specification because the list provides acceptable lubricants for high temperature applications.	Specification to be revised by December 31, 2015	**Confirmatory**
9	Why does the specification not address the use of Appendix QR-B, "Guide for Qualification of Nonmetallic Parts," for environmental qualification of nonmetallic parts?	Scarbrough	The specification will be revised to incorporate the use of QR-B for qualification of nonmetallic parts as follows: "The nonmetallic parts which are critical in performing the safety function shall be environmentally qualified in accordance with QR-B of	Specification to be revised by December 31, 2015	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			ASME QME-1-2007 if applicable."		
10	As editorial comment, Section 10.4.2.3.1 refers to a "stoke" test rather than a stroke time.	Scarbrough	Stoke will be changed to stroke.	Specification to be revised by December 31, 2015.	**Confirmatory**
11	Section 6.5.1.1.2.3, Faulted Condition, in section B) stated "Jet impingement load on POSRV body due to spray line break need not be considered for POSRV outlet flange design". In general, impingement forces on the valve would create bending moments at valve flange to pipe connection. Provide the bases of impingement loads on POSRV body due to spay line break was not considered for POSRV outlet flange design.	Le	Appendix H of the Design Specification provides the BLPB loads at the POSRV outlet flanges. The jet impingement load due to a pressurizer spray line break was considered in the BLPB loads.	Specification Section 6.5.1.1.2.3 "Faulted Condition", section B) sentence to be revised to indicate that Appendix H of the Design Specification provides the BLPB loads at the POSRV outlet flanges.	**Confirmatory**
Document No. 9-431-Z-S-404-10, Design Specification for Reactor Assembly					
1	Section 3.1.1.1 referenced ASME Code Section III 2007 edition with 2008 addenda to be used in APR1400 design. However, Section 3.1.2.1 referenced ASME-B16.5 "Pipe Flanges and Flanged Fitting", 2009 edition. Provide a clarification if ASME-B16.5 2009 edition used in lieu of ASME Section III 2007 edition.	Le	There is a flange at the end of the vent pipe that connects with the A/E pipe. This flange is ASME B 16.5 and, therefore, both ASME III and B16.5 are referenced in Section 3.1.2.1.		**Closed**
2	Section 3.1.3.5, reference showed incorrect the revision date of RG 1.92. Revise the revision date of Oct. 2012 to be Sept. 2012.	Le	Oct. 2012 is shown in the first page of RG 1.92. However, Sept. 2012 is shown on the NRC web site which lists the number, title, publication data, and revision for each regulatory guide. The first page of RG 1.92 was used in Section 3.1.3.5		**Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			since it was taken to be the most accurate.		
3	Section 5.2.1.2 stated that the maximum allowable load criteria shall be defied in terms of axial (Fa), shear (Fv), moment (Mb) and torsional (Mt) loadings at the nozzles end based on a maximum allowable stress of [ ] of yield for ASME Class 1 component at the critical section where the nozzle is welded to the component. Provide the justification where the criteria of [ ] of yield comes from.	Le	The criterion of [ ] of yield strength is an engineering judgment. It is impossible for no piping reactions in partial penetration nozzles such as sampling and instrumentation nozzles. To control the piping loads in partial penetration nozzles, the system designer uses the criterion of [ ] of yield strength.	The use of a maximum allowable stress of [ ] of yield for ASME Class 1 component at the critical section where the nozzle is welded to the component does not clearly define the design of nozzle. The staff requests the applicant provides the stress analysis of these nozzles to address the staff's question.	**Open**
4	Revise Table 4 to include the additional loads in the load combinations. Table 4 Load Combination did not include the following loads: a. Dynamic system loadings associated with service levels B and C. Dynamic fluid loads due to asymmetric blowdown (NUREG-0609), or safety/relief valve thrust, steam hammer, and water hammer associated with service level B. Dynamic system loadings associated with the emergency condition associated with service level C. b. LOCA loadings associated with service level D. Table 1 of SRP Section 3.9.3 showed LOCA loadings applied with service level D.	Le	a. As stated in Table 4 of the Design Specification for Reactor Vessel Assembly, the service level B loads provided in conjunction with upset condition transients provided in Table 5 of the specification will be applied to stress analysis of reactor vessel assembly. Table 5 provides the Post-Accident Operation of reactor coolant gas vent system (RCGVS) which would induce dynamic fluid load such as water hammer associated with service level B. Therefore, dynamic system	Part a: Confirm these loads (safety relief valve thrust, quick valve open/close) are included in the load combination.	**Part a: Confirmatory** **Part b: Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			loadings/dynamic fluid loads associated with service level B condition are already considered in stress analysis of reactor vessel assembly. Other than RCGVS Post-Accident Operation transient, there is no upset condition transients inducing any dynamic fluid load associated with service level B. As specified in Table 5 of the specification, there is no emergency condition transient considered to design. Accordingly, there is no dynamic system loading associated with emergency condition and service level C. b. As stated in Section 3.6.3 of the APR1400 SSAR, Leak-Before-Break (LBB) analyses are applied to the piping systems of the main coolant loop (hot and cold legs), surge line, direct vessel injection line and shutdown cooling line. Therefore, dynamic loads resulted from large break LOCA are eliminated by LBB application, but		

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			dynamic loads resulted from pipe breaks in piping systems not eliminated by LBB application are applied to structural integrity evaluation for reactor vessel assembly as defined as branch line pipe break (BLPB) loads. The load tables in the design specification for reactor vessel assembly provide BLPB loads associated with service level D condition.		
5	Appendix S of 10 CFR Part 50, "Earthquake Engineering Criteria for Nuclear Power Plants," requires that if the OBE is defined as greater than one-third of the SSE, paragraph IV.(a) (2) requires analysis and design to demonstrate that SSCs remain functional and within applicable stress, strain, and deformation limits. If the OBE is defined as one-third or less of the SSE, explicit response or design analyses are not required. Therefore, OBE should not include in load combination. Discuss or specify in Table 4 that OBE is defined as one-third or less of the SSE; therefore OBE should not include in load combinations.	Le	As stated in Section 3.2.1a., Seismic Category I, of the APR1400 SSAR, OBE is defined as one-third of the SSE. Therefore, OBE loads should not be included in the load combinations.		**Closed**
6	Provide the following reference documents: 11A60-ME-DS220-11 11A60-RE-DD214-00 11A60-ME-DS240-00 E-11A60-232-002	Le	Supplied during the audit; no further action necessary.		**Closed**
Document No. 9-450-Z-S-404-00, Design Specification for Check Valves Greater than Two Inches					
1	The specification only mentions swing check valves. Are any other check valve designs planned (such as lift check	Scarbrough	The design specification for NSSS check valves		**Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	or nozzle check valves) for the APR1400?		describes the general requirements applicable to all kinds of check valves including swing check valves and lift check valves. The APR1400 design is to include only swing check valves and spring loaded lift check valves.		
2	Section 6.3.1.1 states that a single axis seismic load may be applied in a "conservative manner." Why does this section not specify that the seismic load be applied along the least rigid axis (unless a more critical axis can be determined) consistent with ASME QME Case QME-007?	Scarbrough	The approach that the seismic load may be applied along the least rigid axis is one method that is considered a conservative manner. Therefore, the current specification of section 6.3.1.1 includes the requirement that the seismic load shall be applied along the least rigid axis.	**Closed** based on POSRV Question 6	**Closed**
3	Section 6.4.3.2 states that the check valve function shall be demonstrated by analysis, by test, or a combination of both per QME-1-2007. Why does the specification not use the language in Paragraph QV-7100 of ASME QME-1-2007 that the Section QV provides for qualification of a valve assembly by a combination of testing and analysis?	Scarbrough	Section 6.4.3.2 will be revised as the NRC commented. "The check valve functions shall be demonstrated by a combination of testing and analysis."	The design specification will be revised by December 31. Confirm that Section 6.4.3.2 states: "The check valve functions shall be demonstrated by a combination of testing and analysis in accordance with ASME QME-1-2007."	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
4	Why does the specification not address the use of Appendix QR-B, "Guide for Qualification of Nonmetallic Parts," in ASME QME-1-2007 for environmental qualification of nonmetallic parts?	Scarbrough	The following will be added to the requirements in the design specification for valves. "The nonmetallic parts which are critical in performing the safety function shall be environmentally qualified in accordance with QR-B of ASME QME-1-2007 if applicable.	The design specification will be revised by December 31.	**Confirmatory**
Document No. 9-450-Z-S-404-14, Design Specification for Motor Operated Valves					
1	Section 6.1.6 states that the orientation of valve stem shall be upright vertical. Why does the specification not address motor and spring pack locations (both horizontal) and limit switch compartment location (above the gear box)?	Scarbrough	It is believed that this level detail design is within the vendor's scope to determine and in specifying an undesirable details in the specification may cause unnecessary limitations. We believe the vendor will determine the proper motor and spring pack locations and limit switch		**Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			compartment location even though the design specification does not address this kind of detail location.		
2	Section 6.3.1.1 states that a single axis seismic load may be applied in a "conservative manner." Why does this section not specify that the seismic load be applied along the least rigid axis (unless a more critical axis can be determined) consistent with ASME QME Case QME-007?	Scarbrough	The approach that the seismic load may be applied along the least rigid axis is one method that is considered a conservative manner. Therefore, the current specification of section 6.3.1.1 includes the requirement that the seismic load shall be applied along the least rigid axis.	**Closed** based on POSRV Question 6	**Closed**
3	Section 6.4.3.2 states that the safety-related function shall be demonstrated by analysis, by test, or a combination of both per QME-1-2007. Why does the specification not use the language in Paragraph QV-7100 of ASME QME-1-2007 that the Section QV provides for qualification of a valve assembly by a combination of testing and analysis?	Scarbrough	Section 6.4.3.2 will be revised to address the NRC comment by stating the following: "The motor operated valve functions shall be demonstrated by a combination of testing and analysis."	The design specification will be revised by December 31. Confirm that Section 6.4.3.2 states: "The motor operated valve functions shall be demonstrated by a combination of testing and analysis in accordance with ASME QME-1-2007."	**Confirmatory**
4	Section 6.4.3.5 states that the valve motor operators are qualified in accordance with IEEE 382-2006 and RG 1.73 (Revision 1). Why does this section not specify that the motor operators also be qualified in accordance with ASME QME-1-2007 as accepted in RG 1.100 (Revision 3)?	Scarbrough	Section 6.4.3.5 requires the valve motor operator to be qualified separately in accordance with IEEE 382 and RG 1.73. The operator shall also be evaluated for functional qualification of		**Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			the valve assembly in accordance with ASME QME-1-2007 as stated in Sections 6.4.3.2 and 6.4.9 a). Therefore, the functional qualification of the motor operator and valve assembly in accordance with ASME QME-1-2007 is specified in Sections 6.4.3.2 and 6.4.9 a).		
5	Section 6.4.9 specifies that the supplier shall perform a list of tests and calculations (such as functional qualification testing per QME-1). Where does the specification address other aspects of valve qualification in QME-1-2007 (such as uncertainties, internal evaluations, extrapolation of qualification, and production valve demonstration)? For example, the Design Specification for Pneumatic Operated Valves 9-450-Z-S-404-13 specifies internal chamfer and radii limits for gate valves.	Scarbrough	It is understood that there is no need to specify the detailed requirements of the vendor's scope which are already addressed in ASME QME-1-2007. However, we will review and incorporate the requisite requirements for qualifying functional capability in accordance with ASME QME-1-2007 if applicable.	The design specification will be revised by December 31.	**Confirmatory**
6	Why does Section 6.4.14 and Appendix I for "weak link" calculations not include specific conservative assumptions, such as 110% voltage and 0.1 stem friction coefficient?	Scarbrough	We will include the requirement to specify the appropriate conservative assumptions.	The design specification will be revised by December 31. .	**Confirmatory**
7	Section 6.4.15 specifies the contents of the Database Package, including information for degraded voltage calculations and EPRI PPM Analysis). Where is the application of the EPRI PPM Analysis addressed in the	Scarbrough	The database package required by Section 6.4.15 is used for preparing the input for performing the	Review spec changes during follow-up audit.	**Open**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	specification?		EPRI PPM analysis which will be performed by KHNP rather than the vendor. The EPRI PPM analysis is not within the scope of the vendor. Therefore, it is not necessary to address the application of EPRI PPM analysis in the design specification.		
8	Why does Section 6.4.19.2 only specify "differential pressure" for MOV sizing and not also flow conditions?	Scarbrough	Section 6.4.19.2 provides the requirements for operator sizing. Operator sizing is dependent on the differential pressure not flow rate. The flow condition necessary to consider for valve sizing is in the data sheet. We understand that differential pressure is the sufficient information for operator sizing.	Review spec changes during follow-up audit.	**Open**
9	Why does Section 6.4.19.13 state that the motor will stall upon failure of the limit or torque switch without specifying requirements for thermal overload protection?	Scarbrough	Section 6.4.19.13 will be revised as follows: "torque switch, and the failure of thermal overload protection."	The design specification will be revised by December 31.	**Confirmatory**
10	Why does Section 6.4.19.32 only specify valve minimum thrust requirements based on differential pressure load, stem rejection load, and packing load, when these loads do not address flow conditions (such as identified in the EPRI MOV Performance Prediction Program)?	Scarbrough	The valve minimum thrust for operator sizing is dependent on the differential pressure not flow rate. The flow condition necessary for	Review spec changes during follow-up audit.	**Open**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			valve sizing is provided in the data sheet.		
11	Where does the specification address actuator sizing, such as degraded voltage, temperature effects, load sensitive behavior, and stem friction coefficient assumptions?	Scarbrough	The next revision will consider these kinds of factors such as degraded voltage, temperature effects, load sensitive behavior, and stem friction coefficient assumptions in actuator sizing.	The design specification will be revised by December 31.	**Confirmatory**
12	Why does the specification not address any limitations for the use of magnesium rotors in motors?	Scarbrough	Limitations for the use of magnesium rotors in motors will be incorporated into the specification as given in the NRC information communication.	The design specification will be revised by December 31.	**Confirmatory**
13	Why does the specification not address design provisions for periodic verification of design-basis capability, such as specifying the use of valves within the test scope of the Joint Owners Group Program for MOV Periodic Verification?	Scarbrough	It is understood that the MOV periodic verification is not within the vendor's scope, but within the utility's scope. Therefore, it is not necessary to address the periodic verification in the design specification.		**Closed**
14	Where does the specification address design requirements for valve instrumentation (such as stem strain gauges) for thrust and torque measurements to allow diagnostic testing?	Scarbrough	It is understood that instrumentation, such as stem strain gauges, is not the scope of vendor, but the scope of the utility. Therefore, it is not necessary to address the instrumentation for periodic verification in design specification.		**Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
15	Where does the specification address vibration effects in light of testing and operating experience for valves that reveals potential impact of vibration on valve degradation and performance?	Scarbrough	Section 6.3.1.1 d) addresses vibration effects in light of testing and operation of valves that results in the potential impact of vibration on valve degradation and performance.	Review section during follow-up audit.	**Open**
16	Why does the specification not address the use of Appendix QR-B, "Guide for Qualification of Nonmetallic Parts," in ASME QME-1-2007 for environmental qualification of nonmetallic parts?	Scarbrough	The following requirements will be addressed in the design specification for valves: "The nonmetallic parts which are critical in performing the safety function shall be environmentally qualified in accordance with QR-B of ASME QME-1-2007 if applicable."	The design specification will be revised by December 31.	**Confirmatory**
Document No. 9-450-Z-S-404-13, Design Specification for Pneumatic Operated Valves					
1	Where is OM Code specified in list of codes in Section 3.2?	Scarbrough	ASME OM code will be addressed in Section 3.2 in the next revision.	The design specification will be revised by December 31.	**Confirmatory**
2	Section 6.3.1 states that a single axis seismic load may be applied in a "conservative manner." Why does this section not specify that the seismic load be applied along the least rigid axis (unless a more critical axis can be determined) consistent with ASME QME Case QME-007?	Scarbrough	The approach that the seismic load may be applied along the least rigid axis is one method that is considered a conservative manner. Therefore, the current specification of section 6.3.1.1 includes the	**Closed** based on POSRV Question 6.	**Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			requirement that the seismic load shall be applied along the least rigid axis.		
3	Section 6.4.3.2 states that the function shall be demonstrated by analysis, by test, or a combination of both per QME-1-2007. Why does the specification not use the language in Paragraph QV-7100 of ASME QME-1-2007 that the Section QV provides for qualification of a valve assembly by a combination of testing and analysis?	Scarbrough	Section 6.4.3.2 will be revised as per the NRC commented. "The pneumatic operated valve functions shall be demonstrated by a combination of testing and analysis."	The design specification will be revised by December 31. Confirm that Section 6.4.3.2 states: "The pneumatic operated valve functions shall be demonstrated by a combination of testing and analysis in accordance with ASME QME-1-2007."	**Confirmatory**
4	Why does Section 6.4.11.1.1 only specify "differential pressure" for sizing and not also flow conditions? Similarly, Section 8.2.1.5 specifies testing against differential pressure. Where is testing against flow conditions addressed?	Scarbrough	Section 6.4.11.1.1 provides the requirements for operator sizing. Operator sizing is dependent on the differential pressure not flow rate. The flow condition necessary to consider for valve sizing is in the data sheet. We understand that differential pressure is the sufficient information for operator sizing. Section 8.2.1.5 specifies the valve testing to demonstrate the capability of both opening and closing. The differential pressure is the main factor	The design specification will be revised by December 31.	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			in demonstrating the capability of valve opening and closing at the design flow rate and that the flow rate is determined upon the differential pressure. Section 8.2.1.5 will be revised to state the following: Valve operation shall be tested against the differential pressure at the design flowrate shown on the data sheets under "OPEN CLOS AGNS DP and FLOW RATE" for both opening and closing.		
5	Section 6.4.13 specifies that the supplier shall perform a list of tests and calculations (such as functional qualification testing). Where does the specification address other aspects of valve qualification in QME-1-2007 (such as extrapolation of qualification, and production valve demonstration)?	Scarbrough	It is understood that there is no need to specify the detailed requirements of the vendor's scope which are already addressed in ASME QME-1-2007. However, we will review and incorporate the requisite requirements for qualifying functional capability in accordance with ASME QME-1-2007 if applicable.	Review spec changes during follow-up audit	**Open**
6	Where does the specification address design requirements for valve instrumentation (such as stem strain gauges) for diagnostic testing?	Scarbrough	It is understood that instrumentation, such as stem strain gauges, is not the scope of vendor, but		**Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			the scope of the utility. Therefore, it is not necessary to address the instrumentation for periodic verification in design specification.		
7	Why does the specification not address the use of Appendix QR-B, "Guide for Qualification of Nonmetallic Parts," in ASME QME-1-2007 for environmental qualification of nonmetallic parts?	Scarbrough	We will address the following requirements in the design specification for valves: "The nonmetallic parts which are critical in performing the safety function shall be environmentally qualified in accordance with QR-B of ASME QME-1-2007 if applicable."	The design specification will be revised by December 31.	**Confirmatory**
Document No. 9-450-Z-S-404-18, Design Specification for Solenoid Operated Valves					
1	Section 6.3.1 states that a single axis seismic load may be applied in a "conservative manner." Why does this section not specify that the seismic load be applied along the least rigid axis (unless a more critical axis can be determined) consistent with ASME QME Case QME-007?	Scarbrough	The approach that the seismic load may be applied along the least rigid axis is one method that is considered a conservative manner. Therefore, the current specification of section 6.3.1.1 includes the requirement that the seismic load shall be applied along the least rigid axis.	**Closed** based on POSRV Question 6.	**Closed**
2	Section 6.4.1.2 states that the function shall be demonstrated by analysis, by test, or a combination of both per QME-1-2007. Why does the specification not	Scarbrough	Section 6.4.1.2 will be revised as per the NRC comment.	The design specification will be revised by December 31. Confirm that Section 6.4.1.2	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	use the language in Paragraph QV-7100 of ASME QME-1-2007 that the Section QV provides for qualification of a valve assembly by a combination of testing and analysis?		"The solenoid operated valve functions shall be demonstrated by a combination of testing and analysis."	states: "The solenoid operated valve functions shall be demonstrated by a combination of testing and analysis in accordance with ASME QME-1-2007."	
3	Section 8.2.1.3 specifies testing against differential pressure. Where is testing against flow conditions addressed?	Scarbrough	Section 8.2.1.3 provides the requirements for operator sizing. Operator sizing is dependent on the differential pressure not flow rate. The flow condition necessary to consider for valve sizing is in the data sheet. We understand that differential pressure is the sufficient information for operator sizing. Section 8.2.1.3 specifies the valve testing to demonstrate the capability of both opening and closing. The differential pressure is the main factor in demonstrating the capability of valve opening and closing at the design flow rate and that the flow rate is determined upon the differential pressure. Section 8.2.1.3 will be revised to state the following:	The design specification will be revised by December 31.	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			Valve operation shall be tested against the differential pressure at the design flowrate shown on the data sheets under "OPEN CLOS AGNS DP and FLOW RATE" for both opening and closing.		
4	Where does the specification address other aspects of valve qualification in QME-1-2007 (such as extrapolation of qualification, and production valve demonstration)?	Scarbrough	Section 8.2.1.3 specifies the valve testing to demonstrate the capability of both opening and capability. We understand that the differential pressure is the main factor to demonstrate the capability of opening and closing at design flowrate and flow rate is determined upon the differential pressure. Section 8.2.1.3 will be revised to state clearly as following: Valve operation shall be tested against the differential pressure at design flowrate shown on the data sheets under "OPEN CLOS AGNS DP and FLOW RATE" for both opening and closing.		**Confirmatory**
5	Why does the specification not address the use of Appendix QR-B, "Guide for Qualification of Nonmetallic Parts," in ASME QME-1-2007 for environmental	Scarbrough	The following requirement will be addressed in the design specification for	The design specification will be revised by December 31.	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	qualification of nonmetallic parts?		valves. "The nonmetallic parts which is critical in performing the safety function shall be environmentally qualified in accordance with QR-B of ASME QME-1-2007 if applicable."		
Document No. 9-450-Z-S-404-16, Design Specification for Manual Valves					
1	Why is the OM Code not included in the list of applicable codes in Section 3.2?	Scarbrough	The ASME OM Code will be addressed in the list of applicable codes in Section 3.2.	The design specification will be revised by December 31.	**Confirmatory**
2	Why is ASME Standard QME-1-2007 not included in the list of standards in Section 3.3 when RG 1.100 (Revision 3) is listed in Section 3.4?	Scarbrough	ASME Standard QME-1-2007 is not applicable because manual valves are not within the scope of ASME QME-1-2007. Functional capability of SI-803 (designated as an active valve) is demonstrated by test in accordance with the approved testing procedure based on other than ASME QME-1-2007.	Review during follow-up audit.	**Open**
3	Section 6.1.5 specifies that the valve will be designed for suitable operation regardless of orientation. Why does the section not include guidance for manual valves with a gearbox and limit switch compartment?	Scarbrough	Manual valves are not normally equipped with gear boxes and limit switches similar to MOVs. It is believed that this level detail design is within the vendor's scope to		**Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			determine and in specifying an undesirable details in the specification may cause unnecessary limitations. We believe the vendor will determine the proper motor and spring pack locations and limit switch compartment location even though the design specification does not address this kind of detail location.		
4	Section 6.3.1.3 states that a single axis seismic load may be applied in a "conservative manner." Why does this section not specify that the seismic load be applied along the least rigid axis (unless a more critical axis can be determined)?	Scarbrough	The approach that the seismic load may be applied along the least rigid axis is one method that is considered a conservative manner. Therefore, the current specification of section 6.3.1.1 includes the requirement that the seismic load shall be applied along the least rigid axis.	**Closed** based on POSRV Question 6.	**Closed**
5	Section 6.4 includes design requirements. Where are provisions for sizing and qualifying the manual valve for its functional capability?	Scarbrough	Provisions for sizing will be clearly addressed in Section 6.1 in next revision. The requirement for qualifying the active manual valve is addressed in data sheet note.	The design specification will be revised by December 31.	**Confirmatory**
6	Section 8.2 specifies testing requirements for manual	Scarbrough	Testing against flow	Review during follow-up	**Open**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	valves. Where is testing against flow conditions addressed?		conditions is addressed in the data sheets for active valves only. The testing against flow condition is not required for non-active valves.	audit.	
7	Where does the specification address other aspects of valve qualification (such as extrapolation of qualification, and production valve demonstration)?	Scarbrough	ASME Standard QME-1-2007 was not applicable for manual valve because manual valves are not the scope of ASME QME-1-2007. The functional capability of active valve will be demonstrated by the test as required by the data sheet note.	Review during follow-up audit.	**Open**
8	Why does the specification not address environmental qualification of nonmetallic parts?	Scarbrough	It is understood that the nonmetallic parts which are critical in performing the safety function is not included for manual valves. Therefore, environmental qualification of non-metallic parts is not required for manual valves.	Review during follow-up audit.	**Open**
9	Why does Appendix F, “Acceptable Lubricants,” list Neolube Number 1 (without conditions) when this lubricant is unacceptable for high temperature applications?	Scarbrough	It will be noted in the specification Appendix F that Neolube 1260 should be used for high temperature applications.	The design specification will be revised by December 31.	**Confirmatory**
Document No. 9-450-Z-S-404-19, Design Specification for Miscellaneous Safety and Relief Valves					
1	Why is the OM Code not included in the list of applicable codes in Section 3.2?	Scarbrough	The ASME OM Code will be addressed in the list of applicable codes in Section	The design specification will be revised by December 31.	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			3.2.		
2	Why are IEEE 323-2003 (2008) and RG 1.89 not included in the list of standards and guides in Sections 3.3 and 3.4?	Scarbrough	The nonmetallic parts of the safety and relief valves are not qualified in accordance with IEEE 323-2003, but in accordance with ASME QME-1-2007, if applicable.		**Closed**
3	Section 6.3.3 states that a single axis seismic load may be applied in a "conservative manner." Why does this section not specify that the seismic load be applied along the least rigid axis (unless a more critical axis can be determined)?	Scarbrough	The approach that the seismic load may be applied along the least rigid axis is one method that is considered a conservative manner. Therefore, the current specification of section 6.3.1.1 includes the requirement that the seismic load shall be applied along the least rigid axis.	**Closed** based on POSRV Question 6.	**Closed**
4	Why does Appendix E, "Acceptable Lubricants," list Neolube Number 1 (without conditions) when this lubricant is unacceptable for high temperature applications?	Scarbrough	It will be noted in the specification Appendix E that Neolube 1260 should be used for high temperature applications.	The design specification will be revised by December 31.	**Confirmatory**
5	Why does the specification not address environmental qualification of nonmetallic parts?	Scarbrough	The specification will be revised to incorporate the use of QR-B for qualification of nonmetallic parts s follows: "The nonmetallic parts which are critical in performing the safety function shall be	The design specification will be revised by December 31.	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			environmentally qualified in accordance with QR-B of ASME QME-1-2007 if applicable."		
APR1400 Purchase Specification 9-184-J237A Main Steam Safety Valves					
1	Section 4.03 lists codes and standards that are not the latest versions or have no year indicated (such as BPV 1995 Edition through 1997 Addenda, OM Code – no year, QME-1 – no year, IEEE 323-1983, IEEE 344-1987, and IEEE 382-1996). Also, RG 1.100 is listed without a revision number. Has a design specification been prepared to update the qualification codes and standards for the main steam safety valves?	Scarbrough	No; The procurement specifications for the APR1400 have not been prepared. The procurement specifications uploaded in ERR were prepared for the reference plant (Shin-Kori NPP Units 3&4) which have different code year from that of APR1400. A design summary will be provided that provides the current APR1400 code and standards; however, the purchase specification for this equipment will be prepared based on the codes and standards and RGs stated in APR1400 DCD by the COL applicant. Therefore a COL Item will be added to the DCD.	Review MSSV qualification during follow-up audit.	**Open**
2	The purchase specification references the codes and standards for design and qualification. Has a design specification been prepared to provide more specific requirements for design and qualification of main steam safety valves?	Scarbrough	Yes; This specification states the design and operating conditions such as operating pressure and temperature, set pressure, etc. in Subsection 4.05.B	Review MSSV qualification during follow-up audit.	**Open**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			and the data sheets. The design requirements in Subsection 4.05.C specify the requirements for dynamic qualification of the valves.		
3	Where does the purchase specification (or a design specification) address environmental qualification of main steam safety valves?	Scarbrough	The environmental design requirements are stated in Subsection 4.05.D.	Review MSSV qualification during follow-up audit.	**Open**
Document No. 9-431-Z-S-404-20, Design for Pressurizer Assembly					
1	Section 6.4.3.4.2 stated "All partial penetration nozzles shall be designed with a nozzle to shell clearance which limits the maximum stress to [ ] of the yield stress for ASME Class 1 component at the critical section where the nozzles is welded to the components". Provide the references or bases of where the [ ] of the yield stress comes from.	Le	Partial penetration welds are allowed only for substantially no piping reaction loads per ASME BPV Code Sec.Ⅲ, NB-3337.3. For confirming the meaning of 'substantially no piping reaction', this limiting stress [ ] of yield stress is used as evaluation criteria from conservative engineering judgment.		**Confirmation**
2	Section 6.5.1, the section specified the loads for to be used in PR stress analysis. However, there is not description and definition of the loads. Provide description and definition of the loads listed in the section 6.5.1.	Le	This response will be provided by September 4, 2015.		**Open**
3	Table 5 did not include the following loads: • Dynamic system loading associated with level B and C (e.g. POSRV thrust, steam hammer, or water hammer). • LOCA Loading associates with level D.	Le	Table 5 includes the following loads : 1) The POSRV actuation envelopes all dynamic system loading related to POSRV actions		**Confirmation**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			which are considered as Level B. There is no Level C load for pressurizer in our design basis events. 2) The BLPB loading in Table 5 is for the breaks of pipe lines to which the LBB concept is not applied. The BLPBs for the PZR includes the breaks of the spray and POSRV lines, (i.e., the surge line is excluded from the postulation of the pipe breaks) owing to the application of the LBB concept. The breaks include the primary side breaks that can result in LOCA.		
4	Provide description and definition of the loads listed in Tables 5, 7 and 8.	Le	This response will be provided by September 4, 2015.		**Confirmation**
Document No. 9-133-N204, Safety Related Heat Exchangers					
1	Section 4.03-Quality Standards states, "All other codes and standards except KEPIC shall be the edition in the effect as of December 31, 2001, unless indicated otherwise." The ASME Section III version cited as applicable for compliance is ASME Section III ('95 Ed. Through '97 Add.). The year of the code specified in the spec does not correspond with the applicable heat exchangers in Table 3.2-1 in the DCD. In Table 3.2-1 the following are stated:	Johanson	The APR1400 procurement specifications for the "Safety Related Heat Exchangers" will be prepared at the stage of COL application. The procurement specification uploaded in ERR, 9-133-N204, was prepared for the reference plant (Shin-Kori	Review design summary and COL item during follow-up audit.	**Open**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	<table><tr><td>Item #</td><td>Principal SSC</td><td>Codes & Standards</td></tr><tr><td>II.9.a</td><td>CCW heat exchangers</td><td>ASME Sec. III ND 2007 with 2008 addenda</td></tr><tr><td>II.18.b</td><td>Containment spray heat exchangers</td><td>ASME Sec. III NC 2007 with 2008 addenda</td></tr><tr><td>II.18.c</td><td>Containment spray miniflow heat</td><td>ASME Sec. III NC 2007 with 2008 addenda</td></tr><tr><td>II.34.a</td><td>Spent fuel pool cooling heat exchangers</td><td>ASME Sec. III ND 2007 with 2008 addenda</td></tr></table> Why is there a difference in the version of the code being used?		NPP Units 3&4) which have different code year from that of APR1400. A design summary will be provided that provides the current APR1400 code and standards; however, the purchase specification for the safety related heat exchangers is issued at the stage of COL application and will be prepared based on the codes and standards and RGs stated in APR1400 DCD by the COL applicant. Therefore a COL Item will be added to the DCD.		
Document No. 9-728-Z-S-404-22, Design Specification for Heated Junction Thermocouple Probe Assembly					
1	Section 4.2.1-Safety Classification states that safety classification of the HJTC components are Safety Class 3 except for the seal plug which is Safety Class 1. For line item II.78.d Heated junction thermocouple probe assembly in Table 3.2-1 of the DCD, the safety class column shows “SC-1/SC-3” and has a remark stating “SC-3: seal plug” which seems to imply that the HJTC components are Safety Class 1 and the seal plug is Safety Class 3, not the opposite as stated in the spec. Identify the correct safety classes for the HJTC components and seal plug.	Johanson	“SC-3: Seal plug” in Table 3.2-1 of the DCD will be revised to “SC-1: Seal plug” as stated in the HJTC design specification.	Confirm that the DCD changes of safety category for HJTC components and seal plug match the design specification.	**Confirmatory**
Document No. 9-521-M243, Main Steam Isolation Valves and Main Feedwater Isolation Valves					
1	What is the date of Revision 2 to this purchase specification?	Scarbrough	The issue date of M243 is July 22, 2009.		**Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
2	Section 4.03 lists codes and standards that are not the latest versions or have no year indicated (such as BPV 1995 Edition through 1997 Addenda, OM Code – not listed, QME-1-1998, IEEE 323, IEEE 344, and IEEE 382). Also, RG 1.100 is listed without a revision number. Has a design specification been prepared to update the qualification codes and standards for the main steam isolation valves and main feedwater isolation valves?	Scarbrough	No; The procurement specifications for the APR1400 have not been prepared. The procurement specifications uploaded in ERR were prepared for the reference plant (Shin-Kori NPP Units 3&4) which have different code year from that of APR1400. A design summary will be provided that provides the current APR1400 code and standards; however, the purchase specification for this equipment will be prepared based on the codes and standards and RGs stated in APR1400 DCD by the COL applicant. Therefore a COL Item will be added to the DCD.	Review MSIV and MFIV qualification during follow-up audit.	**Open**
3	Section 4.06 states that the actuators shall be “self-contained gas hydraulic type or equivalent.” Has a design specification been prepared to provide more specific requirements for the actuator type?	Scarbrough	No not at this time.	Review MSIV and MFIV qualification during follow-up audit.	**Open**
4	The purchase specification references the codes and standards for design and qualification. Has a design specification been prepared to provide more specific requirements for design and qualification of main steam isolation valves and main feedwater isolation valves?	Scarbrough	Yes: This purchase specification states the design and operating conditions such as flow rate, design pressure and temperature, pressure drop, closing time, etc. in	Review MSIV and MFIV qualification during follow-up audit.	**Open**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			Subsection 4.05.B and the dynamic design requirements in Subsection 4.05.C as the specific requirements for design and qualification of the MSIVs and MFIVs.		
5	Where does the purchase specification (or a design specification) address environmental qualification of main steam isolation valves and main feedwater isolation valves?	Scarbrough	The environmental design requirements are stated in Subsection 4.05.D (page 4-23).	Review MSIV and MFIV qualification during follow-up audit.	**Open**
6	ASME QME-1 states that active mechanical qualification should include operating loads such as nozzle loads. Where are the nozzle loads defined?	Wong	This procurement specification does not include the nozzle loads for in-line components. There is a requirement in Subsection 4.05.A.9 (page 4-15).		**Closed**
7	ASME QME-1-2007, Section QR-A8200, "Seismic Qualification Specification Requirements" states that active mechanical equipment mounting or support details, including all interface connections, shall be described. It is not clear how the valves are supported.	Wong	MSIVs and FMIVs are in-line components that are connected to the pipe.		**Closed**
Document No. 9-184-J233, Butterfly Valves for Nuclear Service					
1	Section 4.03 lists codes and standards that are not the latest versions or have no year indicated (such as BPV 1995 Edition through 1997 Addenda, OM Code – no date, QME-1 - no date, IEEE 323, IEEE 344, and IEEE 382-1996). Also, RG 1.100 is not listed. Has a design specification been prepared to update the qualification codes and standards for the butterfly valves?	Scarbrough	No; The procurement specifications for the APR1400 have not been prepared. The procurement specifications uploaded in ERR were prepared for the reference plant (Shin-Kori NPP Units 3&4) which have different code year from that of	Review design summary and COL item during follow-up audit.	**Open**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			APR1400. A design summary will be provided that provides the current APR1400 code and standards; however, the purchase specification for this equipment will be prepared based on the codes and standards and RGs stated in APR1400 DCD by the COL applicant. Therefore a COL Item will be added to the DCD.		
2	The purchase specification references the codes and standards for design and qualification. Has a design specification been prepared to provide more specific requirements for design and qualification of butterfly valves?	Scarbrough	Yes; This purchase specification states the design and operating conditions such as design pressure and temperature, differential pressure, etc. in Subsection 4.05.B and the data sheets. The dynamic design requirements in Subsection 4.05.C specify the requirements for dynamic qualification of the valves.		**Closed**
3	Where does the purchase specification (or a design specification) address environmental qualification of butterfly valves?	Scarbrough	The environmental design requirements are stated in Subsection 4.05.D.		**Closed**
Document No. 9-184-J237B, Safety/Relief Valves					
1	Section 4.03 lists codes and standards that are not the latest versions or have no year indicated (such as BPV 1995 Edition through 1997 Addenda, NQA-1 1994 Edition and 1995 Addenda, QME-1 - no date, and IEEE 323 and	Scarbrough	No; The procurement specifications for the APR1400 have not been prepared. The	Review design summary and COL item during follow-up audit.	**Open**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	IEEE 344 – no dates). Also, the OM Code is not listed. Has a design specification been prepared to update the qualification codes and standards for safety/relief valves?		procurement specifications uploaded in ERR were prepared for the reference plant (Shin-Kori NPP Units 3&4) which have different code year from that of APR1400. A design summary will be provided that provides the current APR1400 code and standards; however, the purchase specification for this equipment will be prepared based on the codes and standards and RGs stated in APR1400 DCD by the COL applicant. Therefore a COL Item will be added to the DCD.		
2	The purchase specification references the codes and standards for design and qualification. Has a design specification been prepared to provide more specific requirements for design and qualification of safety/relief valves?	Scarbrough	Yes; This purchase specification states the design and operating conditions such as design pressure and temperature, differential pressure, etc. in Subsection 4.05.B and the data sheets. The dynamic design requirements in Subsection 4.05.C specify the requirements for dynamic qualification of the valves.		**Closed**
3	Where does the purchase specification (or a design	Scarbrough	The environmental design		**Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	specification) address environmental qualification of safety/relief valves?		requirements are stated in Subsection 4.05.D.		
Document No. 9-184-J239, Solenoid Valves					
1	Section 4.03 lists codes and standards that are not the latest versions or have no year indicated (such as BPV 1995 Edition through 1997 Addenda, QME-1 - no date, RG 1.100 – no date, IEEE 323-1983, and IEEE 344-1987). Also, the OM Code is not listed. Has a design specification been prepared to update the qualification codes and standards for the solenoid valves?	Scarbrough	No; The procurement specifications for the APR1400 have not been prepared. The procurement specifications uploaded in ERR were prepared for the reference plant (Shin-Kori NPP Units 3&4) which have different code year from that of APR1400. A design summary will be provided that provides the current APR1400 code and standards; however, the purchase specification for this equipment will be prepared based on the codes and standards and RGs stated in APR1400 DCD by the COL applicant. Therefore a COL Item will be added to the DCD.	Review design summary and COL item during follow-up audit.	**Open**
2	The purchase specification references the codes and standards for design and qualification. Has a design specification been prepared to provide more specific requirements for design and qualification of solenoid valves?	Scarbrough	Yes; This purchase specification states the design and operating conditions such as design pressure and temperature, differential pressure, etc. in Subsection 4.05.B and the data sheets. The dynamic		**Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			design requirements in Subsection 4.05.C specify the requirements for dynamic qualification of the valves.		
3	Where does the purchase specification (or a design specification) address environmental qualification of solenoid valves?	Scarbrough	The environmental design requirements are stated in Subsection 4.05.D.		**Closed**
Document No. 9-184-J232B, Control Valves for Safety Related and Severe Service					
1	What is the date of Revision 2 to this purchase specification?	Scarbrough	The date of revision is addressed in sign sheet as 11/18/2009.		**Closed**
2	Section 4.03 lists codes and standards that are not the latest versions or have no year indicated (such as BPV 1995 Edition through 1997 Addenda, OM Code – no date, QME-1 - no date, IEEE 323-1983, IEEE 344-1987, and IEEE 382-1996). Also, RG 1.100 is listed without a revision number. Has a design specification been prepared to update the qualification codes and standards for the control valves?	Scarbrough	No; The procurement specifications for the APR1400 have not been prepared. The procurement specifications uploaded in ERR were prepared for the reference plant (Shin-Kori NPP Units 3&4) which have different code year from that of APR1400. A design summary will be provided that provides the current APR1400 code and standards; however, the purchase specification for this equipment will be prepared based on the codes and standards and RGs stated in APR1400 DCD by the COL applicant. Therefore a COL Item will	Review design summary and COL item during follow-up audit.	**Open**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			be added to the DCD.		
3	The purchase specification references the codes and standards for design and qualification. Has a design specification been prepared to provide more specific requirements for design and qualification of control valves?	Scarbrough	Yes; This purchase specification states the design and operating conditions such as design pressure and temperature, differential pressure, etc. in Subsection 4.05.B and the data sheets. The dynamic design requirements in Subsection 4.05.C specify the requirements for dynamic qualification of the valves		**Closed**
Document No. 9-145-P207, Safety & Non-Safety Related Manuel Steel Gate, Globe & Check Valves, 2" and Smaller					
1	Section 4.03-Quality Standards identifies ASME Section III ('95 Ed. Through '97 Add.) as the ASME Section III code year to be used. Most of the valves identified in Table 3.2-1 of the DCD specify ASME Section III code year 2007 with 2008 addenda. Ensure the correct code year to be used for the valves is identified.	Johanson	The correct code year is 2007 with 2008 addenda as noted. Reference document 9-145-P207 was a specification used for the Shin-Kori NPP units 3&4 in South Korea and the effective ASME III is 1995 edition through 1997 addenda for the NPP. It should be noted that 9-145-P207 is a reference only document.		**Closed**
Document No. 1-037-N407-001, General Piping Design Specification					
1	Article 202 states that the standards used are as referenced in Section 4 of 9-144-P202A, 9-144-P251, and 9-144-P252. While 9-144-P251 and 9-144-P252 are not in the ERR, 9-144-P202A is, "Safety Related Shop Fabricated Piping." Section 4, Article 201.2.a identifies	Johanson	The APR1400 procurement specifications for the "Safety Related Shop Fabricated Piping" will be prepared at the stage of	Review design summary and COL item during follow-up audit.	**Open**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	ASME Section III ('95 Ed. Through '97 Add.) as the code and standard to be used. Article 303 on the next page of the spec states that the effective code editions and addenda for construction of piping systems for APR1400 DC are the ASME BPV Code, Section III, Division 1 (2007 Edition with 2008 Addenda). What is the difference between the Standards of Article 202 and the Effective Code Editions called out in Article 303? Does Article 303 override 202? Clarify the correct year to be using.		COL application. The specifications uploaded in the ERR for audit is the one issued for SKN 3&4 NPP which is the reference plant of the APR1400. This is the reason why there is a difference between the Standards of Article 202 and the Effective Code years stated in Article 303. The COL applicant is to incorporate the codes & standards as described in Article 303 "Effective Code Edition" when APR1400 procurement specification "Safety Related Shop Fabricated Piping" is issued at the stage of COL application. Therefore, a COL Item will be added to the DCD.		
Document No. 1-431-N407-001, Reactor Coolant System Piping Design Specification					
1	Please reference the questions from 1-037-N407-001, "General Piping Design Specification". Article 202 states that the standards uses are as listed in Article 202 of Design Specification 1-037-N407-001. Article 303 says the effective Code editions, addenda & Code Cases to be used for construction of the RC system are given in Article 303 of Design Specification of 1-037-N407-001. These lead to two different code years. How will the vendor know which code year to use?	Johanson	The COL applicant is to incorporate the Effective Code Editions, Addenda & Code Cases as stated in Article 303 of Design Specification of 1-037-N407-001 when APR1400 procurement specifications are issued at the stage of COL application.	Review design summary and COL item during follow-up audit.	**Open**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			Therefore, a COL Item will be added to the DCD.		
Document No. 9-431-Z-S-404-91, Design Specification for Reactor Coolant Pump					
1	Section 8.5.5.3 stated “Pump coastdown curves showing decay of speed and flow versus time after motor is deenergized and with test loop at normal operating temperature and pressure”. There is no coastdown curve specifies in this RCP design specification. Add coastdown curves into the specification or reference the coastdown curve from APR1400 DCD.	Le	The acquiring pump coastdown curves stated in Section 8.5.5.2 are with a test loop and are for reference purpose only. The coastdown characteristics with test loop and with the actual plant loop are different from each other in terms of loop configuration and coolant inertia. The pump supplier must meet the coastdown curves as one of the acceptance criteria during shop testing if they are specified in the design specification. However, accurate coastdown curves with a test loop are difficult to develop because they depend on the characteristics of the test loop. It is reasonable that the acceptance criteria for coastdown with a test loop are not specified in the design specification. The verification for pump coastdown curves with the actual plant loop is	Delete Section 8.5.5.3.	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			performed at the site along with the RCS flow rate verification tests during the plant startup tests. DCD Tier 2 Subsection 14.2.12.2.3, Post-Core Reactor Coolant System Flow Measurements, indicates the acceptance criteria: Measured RCS flow coastdown is conservative with respect to the coastdown used in the safety analysis.		
2	Appendix II, Section II, RCP load combinations did not include the locked rotor load. Add RCP locked rotor load into the load combination; or provide the bases of not include this load.	Le	Appendix II, Section II, RCP load combinations includes Level D transients, meaning the faulted events (Level D) described in Table 1 of Appendix II. Faulted Event 3, "Decrease in Reactor Coolant System Flow Rate" includes the "Reactor coolant pump rotor seizure." The description for the Reactor coolant pump rotor seizure (i.e., locked rotor) can be found in Subsection 3.9.1.1.4 of DCD Tier 2.	"Decrease in Reactor Coolant System Flow Rate" was not clear. Add a statement to clarify explicitly that the load of RCP rotor seizure is included in the RCP load combinations.	**Confirmatory**
3	Design Specification for RCP Support, Doc. # 9-431-Z-S-404-A1, Rev. 2. Table 1, Section 5, service level D does not include the locked rotor load. Add RCP locked rotor load associated	Le	This appears to be an incomplete question since it only lists a specification number.	Add a note below Table 1, indicates that RCP locked rotor load is negligible.	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	with service level D into the load combination; or provide the bases of not include this load.		The RCP locked rotor load is negligible whether it is included or not in service level D load combination with SSE, BLPB & IRWST loads. Therefore, there is no impact on APR1400 RCP support integrity.		
Document No. Appendix 4I, Dynamic Qualification Requirements for Nuclear Safety-Related Equipment					
1	Section 2.0, "Definitions" limits the scope of the dynamic qualification program to safety-related equipment and any equipment that is not designed as safety related but could degrade the integrity of the safety-related component. The mechanical and electrical equipment that should be seismically qualified should be consistent with those defined in NUREG-800, Section 3.10. SRP Section 3.10 indicates that the following mechanical and electrical equipment should be seismically qualified: equipment associated with systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling, containment and reactor heat removal or are otherwise essential in preventing significant release of radioactive material to the environment, and instrumentation that is needed to assess plant and environmental conditions during and after an accident, as described in RG 1.97. Also covered by SRP Section 3.10 is equipment: (1) that performs the above functions automatically, (2) that is used by the operators to perform these functions manually, and (3) whose failure can prevent the satisfactory accomplishment of one or more of the above safety functions. The equipment within the scope of seismic qualification may contain more than the safety-related equipment as defined in 10 CFR 50.2. As an example,	Wong	The response to this Action Item will be provided in the referred to RAI.		**Open**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	the instrumentation that is needed to assess plant and environmental conditions during and after an accident may not be included in the safety-related equipment as defined in 10 CFR 50.2. Note that an RAI was issued for APR1400 DCD, Tier 2, Section 3.10 on this issue.				
2	APR1400 DCD Tier 2, Section 3.10.1.1 states that experience-based qualification will not be used for any equipment until it is endorsed by NRC RG 1.100; however, Section, 4.0, "Qualification requirements," Section 5.4, "Qualification by the use of experience data," and Section 11.0, "Experience Data" list the option for experience-based qualification method. Revise Appendix 4I to be consistent with the DCD.	Wong	As responded to in the RAI, the use of experience data will be deleted by the COL applicant.		**Confirmatory**
3	ASME QME-1-2007, Section QR-A8300, "Qualification Report" lists information to be included in the qualification report; however, the following information is not found in Section 15.0, "Format of the Dynamic Qualification Reports" of the Appendix 4I: a. If analysis is used to qualify the active mechanical equipment, the failure modes used to determine functional adequacy shall be clearly identified and computed margins to failure presented. b. If an anomaly is experienced during any test, it shall be documented in the report. This section goes on to state that if the active mechanical equipment is not modified to eliminate the anomaly, then the final user shall justify the use of the active mechanical equipment and file this justification with the Seismic Qualification Report. Any active mechanical equipment refurbishment that is performed during seismic testing shall be documented in the test report and reconciled by the active mechanical equipment supplier. c. All documents used in generating the Seismic	Wong	Appendix 4I provides the requirements for Dynamic Qualification. Active Mechanical equipment need separate requirements (QME-1). It is not necessary to reference QME-1 in Appendix 4I.		**Open**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	Qualification Report shall be identified and referenced.				
4	ASME QME-1 is not included as a reference.	Wong			**Open**
5	The SRP references listed in Section 16.0, "References" should be "NUREG-0800 (SRP 3.7, 3.9 and 3.10)."	Wong	COL applicant will revise the Appendix 4I.		**Confirmatory**
6	RG 1.199, "Anchoring Components and Structural Supports in Concrete" endorses ACI 349 01, "Code Requirements for Nuclear Safety Related Concrete Structures," Appendix B with conditions. Table III, "Strength Limits for Anchor Bolts in Building Structure" references ACI 349-01 Appendix B for the design of equipment anchoring to building structure. RG 1.199 should be listed as a reference in Section 16.0, "References," and a note should be added to Table III to indicate that the conditions in RG 1.199 will be followed.	Wong	COL applicant will revise the Appendix 4I.		**Confirmatory**
7	The notes for Table III should be consistent with those for Technical Report APR1400-E-X-NR-14001-P, "Equipment Qualification Program," Rev. 0, Part 2, "Seismic Qualification Program," Table 3, "Stress Limits for Bolting to Steel Building Structure."	Wong	COL applicant will revise the Appendix 4I.		**Confirmatory**
Generic Comments					
1	Are there any ISO drawings available that show the piping and component supports and their seismic category and quality group?	Johanson	The ISO drawings have been prepared for some Class 1 piping subsystems and MS, FW piping. However, the drawing doesn't show supports and their seismic category and quality group. The seismic category and quality group are addressed in P&ID drawings. The pipe support locations are shown in the		**Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			ISO drawings for pipe stress analysis.		
2	The NRC staff has provided comments on several sampled design and purchase specifications as part of the APR1400 design specification audit. In addition to the specific sampled design specifications, KHNP is requested to review and update other applicable design specifications to be consistent with the KHNP responses to the NRC staff comments on the audited specifications.	Scarbrough	KHNP will review and update the other applicable design specifications to be consistent with the KHNP response to the NRC staff comments on the audited specifications.	Review during follow-up audit.	**Open**
APR1400 Balance of Plant (BOP) Safety-Related Pumps and Valves					
1	The design specifications included in the Electronic Reading Room apply to pumps and valves within the APR1400 Nuclear Steam Supply System (NSSS). The NRC staff has prepared a sample list of safety-related pumps and valves in APR1400 Balance of Plant (BOP) Systems. The staff requests that KHNP make available design specifications (or information to be provided in design specifications) for the following sample list of safety-related pumps and valves in the identified APR1400 BOP Systems: **Auxiliary Feedwater System (AF)** AF Turbine-Driven Pump PP01B AF Motor-Driven Pump PP02A AFW Discharge Check Valve V1004B AFW Containment Isolation MOVs V043 and V046 **Containment Spray System (CSS)** Containment Spray Pump Containment Spray Isolation Valve MOV V003 Containment Spray Check Valve V1007 Containment Spray Relief Valve CS-1005 **Component Cooling Water System (CCWS)** CCW Pump PP02B MOVs V143 and V191 CCW Pump Discharge Check Valve V1003	Scarbrough	There are several specifications and information to be provided for NRC audit. The supporting documents to show the interfaces between the specifications and design documents will be prepared by the end of September.	The time it takes to prepare supporting documents is due to following: - Identification and listing of interface design documents. - Identification of data in the specifications which come from design documents. - Marking up in the specifications pointing out the design documents and the locations. - Placing a cloud in the design documents of the information which is required for the preparation of the specifications. Review during follow-up audit	**Open**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	Essential Service Water System (ESWS) ESW Pump PP02A ESW Pump Discharge Check Valve V1004 ESW MOV V0045 **Spent Fuel Pool Cooling and Cleanup System (SFPCCS)** SFP Cooling Pump PP01B SFP Cooling Pump Discharge Check Valve V1005 SFP Containment Isolation Valve V1144 **Essential Chilled Water System (ECWS)** ECW Pump PP02A ECW Discharge Check Valve V1010A **Main Steam and Feedwater Systems** Main Steam Safety Valve MS-V1301 Main Steam Isolation Valve MS-V011 Main Feedwater Isolation Valve FW-V121				
Document No. APR1400 Design Specification for Check Valves Greater than Two Inches					
1	APR1400 DCD Tier 1, Figure 2.4.6-1, "Chemical and Volume Control System," on page 24.-95 indicates Check Valve CV-433 in the injection line for the charging pumps. APR1400 Design Specification 9-450-Z-S-404-00 includes check valves in the CVCS with a CH- identification. Is CVCS check valve 433 included in this design specification?	Scarbrough	CH-433 is a CVCS check valve with a size less than 2 inches. Check valves less than 2 inches are not included in the NSSS design specification, but will be included in the BOP procurement specification.	Review qualification of small check valves that have significant safety functions during follow-up audit.	**Open**
Document No. 9-431-Z-S-404-A2 Design Specification for Reactor Coolant Pump Hydraulic Snubbers					
1	Section 6.3.4.3 states that the snubber system shall remain functional for 24 months without maintenance. Why does Section 6.3.4.3 only require the snubber to remain functional for 24 months when the design life is specified as 60 years in Section 6.3.4.5?	Scarbrough	This requirement is for the snubber's in-service inspection. The snubber system shall maintain their function for more than the 18 month plant refueling cycle and the performance can be inspected and		**Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			tested during every plant refueling outage.		
2	Section 10.0 specifies testing of the snubber in accordance with Reference 3.1.2.5 (ASME QME-1-2007). Where does the specification require that the other qualification provisions in ASME QME-1-2007 be satisfied?	Scarbrough	The related requirements are specified in the Sections 4.2.2, 4.2.3, 5.2, 6.4.1, and 6.2, 8.2 of Appendix A.	Review during follow-up audit.	**Open**
3	Table 2 specifies the environmental data for the snubbers. Where is the environmental qualification method addressed in the design specification?	Scarbrough	The related requirements are specified in the Sections 4.2.3 and 6.2.	Review during follow-up audit.	**Open**
4	Appendix C, "Fastener Lubricants," lists Neolube Number 1 without conditions for its use in high temperature applications.	Scarbrough	Since the maximum temperature of the environmental condition, including MSLB & LOCA, for the snubber is less than 400 ^{o}F, (as shown in Table 2 of design specification), there is not a problem to use Neolube Number 1 in this application. Alternative lubricants for higher temperature applications are listed in Appendix C, "Fastener Lubricants."		**Closed**
Document No. 9-431-Z-S-404-62 Design Specification for Steam Generator Upper Support Snubber					
1	Section 6.3.4.3 states that the snubber system shall remain functional for 24 months without maintenance. Why does Section 6.3.4.3 only require the snubber to remain functional for 24 months when the design life is specified as 60 years in Section 6.3.4.5?	Scarbrough	This requirement is for the snubber's in-service inspection. The snubber system shall maintain their function for more than the 18 month plant refueling cycle and the performance can be inspected and tested during every plant		**Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
			refueling outage.		
2	Section 10.0 specifies testing of the snubber in accordance with Appendix D of the specification. Where does the specification require that the qualification provisions of ASME QME-1-2007 be satisfied?	Scarbrough	The related requirements are specified in the Sections 4.2.2, 4.2.3, 5.2, 6.4.1, and 3.5, 8.2 of Appendix A.	Review during follow-up audit.	**Open**
3	Table 2 specifies the environmental data for the snubbers. Where is the environmental qualification method addressed in the design specification?	Scarbrough	The related requirements are specified in the Sections 4.2.3 and 6.2.	Review during follow-up audit.	**Open**
4	Appendix C, "Fastener Lubricants," lists Neolube Number 1 without conditions for its use in high temperature applications.	Scarbrough	Since the maximum temperature of the environmental condition, including MSLB & LOCA, for the snubber is less than 400 ^{o}F, (as shown in Table 2 of design specification), there is not a problem to use Neolube Number 1 in this application. Alternative lubricants for higher temperature applications are listed in Appendix C, "Fastener Lubricants."		**Closed**
Document No. 9-145-P206A Safety Related Steel Gate and Globe Valves with Actuator					
1	Section 4.03 references KEPIC MN Code (2000 Edition) rather than the ASME BPV and OM Codes, and QME-1 Standard and RG 1.100 (Revision 3). Please explain this reference to the KEPIC MN Code rather than ASME codes and standards in the purchase specification.	Scarbrough	KEPIC is a translated version of the ASME Codes and there is no basic difference between the codes. KEPIC is mandatory for Korean domestic suppliers and the ASME code is applicable to overseas suppliers.		**Closed**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
2	The valve-specific design specifications that are developed based on this purchase specification will need to be updated consistent with the NRC staff comments on other design specifications (such as the use of QME-1-2007 for valve qualification, and flow considerations in sizing valve actuators).	Scarbrough	The valve specific design specification should be updated per NRC comments by COL applicant.	Review during follow-up audit.	**Open**
Document No. 9-542-H206, Auxiliary Feedwater Pumps and Drivers					
1	Section 4.05.A.19, "CGI Dedication," of Specification 9-542-H206, "Auxiliary Feedwater Pumps and Drivers," Revision 2 states, "The CGI dedication items listed in Attachment 4-1 shall be qualified as nuclear grade items based on guidelines of EPRI NP-5652, NP-6406, TR 106439 and GL 91-05. The dedication plan/program, reports and certificate of conformance for dedicated item shall be submitted." NRC Information Notice 2014-11, "Recent Issues Related to the Qualification and Commercial Grade Dedication of Safety-Related Components," provides examples where vendors had not implemented sufficient controls to verify that safety-related equipment supplied for use in nuclear power plants was qualified to meet it design requirements. Inadequate implementation of the commercial grade dedication process might result in commercial grade items (CGIs) not being properly qualified to perform their safety functions. Therefore, IN 2014-11 states that NRC staff has accepted ASME Standard QME-1-2007 in RG 100 (Revision 3) for the qualification of mechanical equipment used in nuclear power plants. The qualification process described in ASME QME-1-2007 as accepted in RG 1.100 (Revision 3) should be used for the qualification of mechanical equipment (including nonmetallic parts) regardless of the equipment's origin as a safety-related component or a CGI.	Strnisha	ASME QME-1-2007 will be incorporated into this purchase specification in accordance with APR1400 DCD by the COL applicant. NRC IN 2014-11 will be incorporated into this purchase specification in accordance with APR1400 DCD by the COL applicant. KHNP understands that Attachment 4-1 is not necessary for the audit because Attachment 4-1 is for SKN 3&4 and that of APR1400 may be changed according to the supplier of this purchase specification.	As stated by KHNP in the response, ASME QME-1-2007 as accepted by RG 1.100 Revision 3 and NRC IN 2014-11 will be incorporated into this purchase specification in accordance with APR1400 DCD by the COL applicant. Note: Staff will not review Attachment 4-1 because ASME QME-1-2007 and NRC IN 2014-11 will be incorporated into this purchase specification.	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	Will the qualification process described in ASME QME-1-2007 as accepted in RG 1.100 (Revision 3) be used for the qualification of mechanical equipment (including nonmetallic parts) regardless of the equipment's origin as a safety-related component or a CGI? If not, please describe the qualification process. Will NRC Information Notice 2014-11, "Recent Issues Related to the Qualification and Commercial Grade Dedication of Safety-Related Components," be added as a reference to Section 4.05.A.19, "CGI Dedication," of Specification 9-542-H206?Also, please provide Attachment 4-1 for staff review. This is a generic comment that should be applied to all design and procurement specifications.				
2	Section 4.05.C.11 of Purchase Specification 9-542-H206, "Auxiliary Feedwater Pumps and Drivers," states, that "the supplier shall prove by test and/or analysis the operability of the equipment before, during and after an accident in accordance with Appendix I and ASME QME-1." Will this pump (including mechanical seal) testing be performed by test or a combination of test and analysis? This should be consistent throughout the specification.	Strnisha	The requirement of Section 4.05.C.11 is for providing the qualification method for the operability of equipment to the supplier (e.g., the test, analysis or test and analysis combination is available).	1. The safety-related Auxiliary Feedwater Pumps shall be qualified in accordance with ASME QME-1-2007. 2. The specification should be revised as follows: The pumps and associated mechanical seals shall be qualified by test or a combination of test, in accordance with ASME QME-1-2007 accepted by RG1.100 Revision 3.	**Confirmatory**
3	Purchase Specification 9-542-H206, "Auxiliary Feedwater Pumps and Drivers," addresses both motor driven and turbine driven auxiliary feedwater pumps. Sections 4.05.C.8, 4.05.C.10, and 4.05.C.11 of the specification describe QME-1-2007 testing for pumps and valves. However, the specification does not specifically address		COL applicant will conform to the ASME QME-1-2007 based on the APR1400 DCD.	1. The specification should be revised to state the following: The turbine driver shall be qualified by test or a combination of test, in	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	ASME QME-1-2007 qualification for auxiliary feedwater turbine drivers. Will the feedwater turbine drivers be qualified in accordance with ASME QME-1-2007? If not, please describe the qualification process.			accordance with ASME QME-1-2007 accepted by RG1.100, Revision 3.	
Document No. 9-442-N023 Containment Spray Pumps					
1	Section 4.05.A 6 states that the "the pumps shall be designed, constructed, tested and stamped in accordance with the requirements of the KEPIC MNC (Class 2 components) and this specification. The suppliers shall prepare pump design report in accordance with the requirements of the Code and submit it to the buyer for review." Do KEPIC MNC (Class 2 components) and this specification include all design and testing (functional, environmental and seismic) requirements specified in the pump technical specifications document and the APR1400 DCD? Is a copy of KEPIC MNC be available for staff review?	Strnisha	KEPIC MNC code is based on ASME Code Section III, NC, and if any conflict exists between the two codes, ASME codes take precedence. Therefore, NRC can refer to the ASME Section III NC Code instead of KEPIC MNC. Yes, the code and the specification include all requirements for performance, design and testing, and information is described in APR1400 DCD.	1. Based on KHNP response, this section applies to ASME Section III testing, not QME-1. 2. Based on KHNP response, the code and the specification include all requirements for performance, design and testing, and information is described in APR1400 DCD. Staff will confirm that the code and specification include all design and testing (functional, environmental and seismic) requirements.	**Confirmatory**
Document No. 9-132-N202 Safety Related Centrifugal Pumps					
1	Section 4.05.A 5 states that the "the pumps shall be designed, constructed, tested and stamped in accordance with the requirements of the KEPIC MNC (Class 2 components) and this specification. The suppliers shall prepare pump design report in accordance with the requirements of the Code and submit it to the buyer for review." Do KEPIC MNC (Class 2 components) and this specification include all design and testing (functional, environmental and seismic) requirements specified in the	Strnisha	KEPIC MNC code is based on ASME Code Section III, NC, and if any conflict exists between the two codes, ASME codes take precedence. Therefore, NRC can refer to the ASME Section III NC Code instead of KEPIC MNC. Yes, the code and the	1. Based on KHNP response, this section applies to ASME Section III testing, not QME-1. 2. Based on KHNP response, the code and the specification include all requirements for performance, design and testing, and information is	**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	pump technical specifications document and the APR1400 DCD? Is a copy of KEPIC MNC be available for staff review?		specification include all requirements for performance, design and testing, and information is described in APR1400 DCD.	described in APR1400 DCD. Staff will confirm that the code and specification include all design and testing (functional, environmental and seismic) requirements.	
Document No. 9-9-447-N206132-N202 Safety Related Centrifugal Pumps					
1	In Section 4.05 Design Conditions, Subsection 22 stated that the strainers shall be cap[able of withstanding the force of full debris loading, inertial effects of water in IRAST, hydrodynamic loads induced by the discharge of water, air, and single and two-phase steam due to the opening of the pressurizer pilot operated relief valve (POSRV) into the IRAWST without collapse or structural deformation, in conjunction with all design basis conditions including seismic. To confirm this design condition of the strainers meeting the RG 1.82 and GSI-191, the staff requests the applicant provides the structure analysis reports (or stress analysis reports) of the IRWST strainers for the staff's review.	Le	Debris loads, inertial effects of water in IRWST, and hydrodynamic are considered in the IRWST sump strainer stress analysis which is described in APR1400-E-N-NR-14002-NP, Revision 0, IRWST Sump Strainer and Trash Rack Structural Analysis.		**Confirmatory**
2	In Section 4.05 Design Conditions, Subsection 23 stated that the strainers are designed to have a design life of 40 years of normal operation plus one (1) year of accident operation at the specified conditions. In general, the components are designed to 60 years. The staff requests the applicant provides the bases of the strainers that are designed to 40 years life of normal operation plus one year of accident operation at the specified conditions.	Le	The design life for RCS main components and Class 1 piping is 60 years, and the design life for Class 2 and 3 piping and other components except RCS main components is 40 years. (Refer DCD Table 3.9-1, Transients Used in Stress Analysis).		**Closed**
3	In Section 4.05 Design Conditions, Subsection B "Operating and Design Conditions" specified strainer allowable head loss of 1.5 (ft-water). Provide a	Le	While the allowable head loss of 1.5 ft-water is for the reference plants, SKN 3&4,		**Confirmatory**

No.	Description	NRC Staff	KHNP Response/Status	NRC Staff Notes/Comments	NRC Status
	clarification if the allowable head loss of 1.5 (ft-water) was based on the strainer with a maximum post -LOCA debris.		the allowable head loss for APR1400 is 2 ft-water which is indicated in Section 3.5 and 3.6 of APR1400-E-N-NR-14001-P, Revision 0, Design Features to Address GSI-191.		
Document No. 9-135-P216 Safety Related Strainers, 9-441-Z-S-404-32 Heat Exchangers, 9-451-Z-S-404-41 Design Specification for Volume Control Tank					
1	Similar to question #2 from page 41 of this table, other equipment: Safety Related Strainers, Spec. # 9-135-P216; Design Specification for Shutdown Cooling Pump Miniflow Heat Exchanger, Spec # 9-441-Z-S-404-32, Design Specification for Volume Control Tank, Spec. 9-451-Z-S-404-41 are designed to 40 years life. Provide the bases of the equipment designed to 40 years life.	Le	The other equipment including the volume control tank is safety class 2 or 3 and located outside the reactor coolant pressure boundary (RCPB). The above-stated equipment is replaceable after design life. The equipment which is safety class 2, or 3, located outside the RCPB and replaceable are designed to a design life of 40 years for APR1400.		**Closed**