
SUPPLEMENTAL RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

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

Docket No. 52-046

RAI No.: 334-8373

SRP Section: 03.12 – ASME Code Class 1,2, and 3 Piping Systems and Piping Components and Their Associated Supports

Application Section: Section 3.12

Date of RAI Issue: 12/14/2015

Question No. 03.12-17

According to SRP Section 3.12, Subsection II.D.xi, pipe support gaps should account for the diametrical expansion of the pipe due to pressure and temperature.

DCD Tier 2, Section 3.12.6.11, "Pipe Support Gaps and Clearances," states that the normal design practice for the APR1400 is to use a nominal cold condition gap of 1.6 mm (1/16 inch) on each side of the pipe in the restrained direction and that these small gaps allow radial thermal expansion of the pipe as well as allow rotation of the pipe at the support.

The applicant is requested to discuss how the specified pipe support gap will be checked against the maximum combined radial growth of the pipe due to temperature and pressure to assure that adequate clearance exist to avoid any thermal binding. To the extent that the response addresses programmatic or operational activities that are outside the scope of design certification, the applicant is requested to describe these and include in the DCD a provision for COL applicants to describe these activities.

Response

As stated in DCD Tier 2 Section 3.12.6.11, support gaps are provided on each side of the pipe in the restrained direction and the designed gaps are included in the design drawings. In accordance with NRC Bulletin 79-14, piping system reconciliation (including supports) is performed in the construction stage to verify that as-built support configuration (including the location, orientation, size, gap) is reconciled with the as-designed support configuration. Through this piping system reconciliation, the pipe support gaps are checked to ensure they are constructed in accordance with design to avoid any thermal binding.

A related statement is included in DCD Tier 1 ITAAC for each system that an inspection of the as-built piping including supports be performed as documented in the ASME design report or data report. This is also consistent with the statements in DCD Tier 2 Section 3.12.2.3, "In

addition, ASME Section III requires that design reports for all ASME Class 1, 2, and 3 piping systems demonstrating and documenting that as-built piping system and pipe support configurations adhere to the requirements of the design specification (Reference 6).”

Supplemental Response

The design practice for the APR1400 is to use a nominal cold condition gap of 1.6 mm (1/16 in) on each side of the pipe in the restrained direction as described in Welding Research Council (WRC) Bulletin 353. For the large diameter (>24 in) high temperature (>350 °F) piping, the gap is calculated considering temperature and pressure to allow free radial expansion of the pipe and applied to the support design. These criteria will be included in the design specification to ensure that the gap provided is sufficient.

Currently, the pipe supports for the large diameter, high temperature piping in the RCB have been designed as clamp type. If designs of frame type supports are needed on the large diameter high temperature piping, the gap considering the diametrical expansion of the pipe will be specified on the each pipe support design drawing.

Impact on DCD

DCD Tier 2, Section 3.12.6.11 will be revised as indicated in the attached markup.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environment Report; however, General Piping Design Specification 1-037-N407-001 will be revised to incorporate the gap criteria.

APR1400 DCD TIER 2**3.12.6.11 Pipe Support Gaps and Clearances**

For guide type pipe supports modeled as rigid restraints in the piping analysis, the typical industry design practice is to provide small gaps between the pipe and its surrounding structural members. These small gaps allow radial thermal expansion of the pipe as well as allow rotation of the pipe at the support. The normal design practice for the APR1400 is to use a nominal cold condition gap of 1.6 mm (1/16 in) on each side of the pipe in the restrained direction. The COL applicant is to determine maximum radial thermal expansion at its design temperature (COL 3. 12(7)).

3.12.6.12 Instrumentation Line Support Criteria

The design and analysis loadings, load combinations, and acceptance criteria to be used for instrumentation line supports are similar to those used for pipe supports. The applicable design loads include deadweight, thermal expansion, and seismic loadings where appropriate. The applicable loading combinations similarly follow those used for the ASME Section III Levels in Table 3.9-10 using the design loadings mentioned above. The acceptance criteria are in accordance with ASME Section III, Subsection NF for seismic Category I instrumentation lines, AISC 360-05 (Reference 14) for non-seismic instrumentation lines.

3.12.6.13 Pipe Deflection Limits

For standard component pipe supports using standard manufactured hardware components, the manufacturer's recommendations for limitations in its hardware are followed. The limitations are travel limits for spring hangers; stroke limits for snubbers; swing angles for rods, struts, and snubbers; alignment angles between clamps or end brackets with their associated struts and snubbers; and the variability check for variable spring supports. In addition to the manufacturer's recommended limits, allowances are made in the initial designs for tolerances on such limits. This is especially important for snubber and spring design in which the function of the support may be changed by an exceeded limit.

If frame type supports are used for the larger diameter (>24 in) high temperature (>350 °F) piping, the gap is calculated considering temperature and pressure to allow free radial expansion of the piping and the gap is specified on the pipe support design drawing.