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Acceptability of ASME Code Section III, Division 5, “High Temperature Reactors”

Comment On: NRC-2021-0117-0001
Acceptability of ASME Code Section III, Division 5, High Temperature Reactors

Document: NRC-2021-0117-DRAFT-0006
Comment on FR Doc # 2021-17916

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General Comment

Comments on Draft Regulatory Guide (DG), DG–1380

Attachments

10-19-21_NEI_Comments on NRC DG-1380

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October 19, 2021

Office of Administration
ATTN: Program Management, Announcements and Editing Staff
Mail Stop: TWFN-7-A60M
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Comments on Draft Regulatory Guide (DG), DG–1380 (proposed Revision 2 to Regulatory Guide [RG] 1.87), "Acceptability of ASME Code Section III, Division 5, 'High Temperature Reactors,'" and accompanying draft NUREG–2245, "Technical Review of the 2017 Edition of ASME Section III, Division 5, 'High Temperature Reactors'" [Docket ID NRC–2021–0117]

Project Number: 689

Submitted via Regulations.gov

Dear Program Management, Announcements and Editing Staff:

On behalf of the Nuclear Energy Institute's (NEI)[1] members (hereinafter referred to as industry), we appreciate the opportunity, as requested in an August 20, 2021 Federal Register Notice (86 FR 46888), to provide comments on the U.S. Nuclear Regulatory Commission's (NRC) draft regulatory guide (DG), DG–1380 (proposed Revision 2 to Regulatory Guide [RG] 1.87), "Acceptability of ASME Code Section III, Division 5, 'High Temperature Reactors,'" and accompanying draft NUREG–2245, "Technical Review of the 2017 Edition of ASME Section III, Division 5, 'High Temperature Reactors.'" The draft NUREG provides the technical basis for DG–1380 and documents the NRC staff's review of the 2017 Edition of ASME Section III, Division 5, certain portions of the 2019 Edition, and associated Code Cases N–861 and N–862.

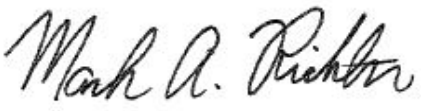
[1] The Nuclear Energy Institute (NEI) is responsible for establishing unified policy on behalf of its members relating to matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include entities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect and engineering firms, fuel cycle facilities, nuclear materials licensees, and other organizations involved in the nuclear energy industry.

We agree with the action that NRC is taking because the current version of RG 1.87 (Revision 1) does not reflect the changes and updates with respect to modern design, fabrication, inspection, testing, and overpressure provisions (among others) addressed by the aforementioned Code iterations, research, and operating experience. This revision (Revision 2) updates the guidance to endorse with conditions, the 2017 Edition of ASME Code Section III, Division 5, certain portions of the 2019 Edition, and associated Code Cases N–861 and N–862 as a method acceptable to the staff for the materials, mechanical/structural design, construction, testing, and quality assurance of mechanical systems and components and their supports of high temperature reactors.

Industry encourages the NRC to consider additional opportunities to gain new regulatory efficiencies that improve safety focus. To that end, the attached documents provide several general comments as well as a number of detailed comments which identify specific opportunities to improve or clarify the Draft RG and associated NUREG.

Again, we appreciate the opportunity to provide these comments for NRC consideration. If you have any questions or require additional information, please contact me at 202-439-0954, mar@nei.org.

Sincerely,



Mark A. Richter

Attachments

c: Jeffrey Poehler, Office of Nuclear Regulatory Research, NRC
Robert Roche-Rivera, Office of Nuclear Regulatory Research, NRC
Jordan Hoellman, Office of Nuclear Reactor Regulation, NRC

NEI/Industry Comments on DG-1380

Affected Section	Comment/Basis	Recommendation
1. General Section III, Division 5, Code Cases	Should add a statement that Code Cases may be implemented upon ASME Committee approval.	Revise/Add
2. General Section III, Division 5, Code Cases	Should add a statement that deviations from Code Case may be made with appropriate 50.59 analysis or equivalent analysis.	Revise/Add
3. Section 1 p. 12 (y)	HGB-3224, Level C Service Limits (1): When extrapolating t_{ib} using Figures HBB-I-14.4A through HBB-I-14.4E to obtain t_{ib} in accordance with HGB-3224(d), the maximum t_{ib} value for any stress and temperature combination should not exceed 300,000 hours or the end of the curve for the temperature of interest, whichever is less. Basis Text NUREG-2245 Basis Text NUREG-2245 (from page 3-192 line 43 to 3-193 line 14) **HGB-3224 Level C Service Limits** Paragraph HGB-3224 serves the same purpose and is technically equivalent to paragraph HBB-3224, except for HGB-3224(d) as described below. HGB-3224(d) indicates, in part, that it is permissible to extrapolate the allowable stress intensity at temperature curve (Figures HBB-I-14.3A through HBB-I-14.3E and Figures HBB-I-14.4A through HBB-I-14.4E) to determine time value (t_{ib}) when computing use-fractions, and that any such extrapolation and the method used should be reported in the Design Report (ASME Code, NCA-3551.1). The staff notes that Figures HBB-I-14.3A through HBB-I-14.3E provide S_{mt} values while Figures HBB-I-14.4A	Extrapolation to determine the allowable time for use-fractions is an intended use of the Code, both to obtain t_{ib} in HGB-3224(d) and in other portions of the Code, including those referenced by the staff in the discussion of NUREG-2245 page 3-193. Extrapolation is not prohibited elsewhere in the Code; the Code is silent on extrapolation in the referenced paragraphs, which does not prohibit extrapolation as indicated in the Foreword to the Code, "the Code does not address all aspects of these activities and those aspects that are not specifically addressed should not be considered prohibited." Prohibiting extrapolation for determining allowable times may place an economic penalty on designs by restricting component design life or requiring significant overdesign to obtain the required life. It is noted that HGB-1124 restricts the time at elevated temperature to the maximum time associated with S_{mt}; extrapolation does not permit increasing the operating time at elevated temperature beyond the restriction of HGB-1124, but rather allows for calculation of the use-fraction in conditions of low operating stress relative to the allowables.

Affected Section	Comment/Basis	Recommendation
	3-193through HBB-I-14.4E provide S_t values, and that the procedure described in HGB-3224(d) only uses the S_t values. The staff also notes that extrapolation is not permitted for the procedure of HGB-3224(b) to determine the use-fraction associated with primary membrane stresses, nor is it approved in the corresponding paragraph in HBB-3224 for the time fractions associated with primary membrane stresses and primary membrane plus bending stresses. Since the creep test data were generally already extrapolated by a factor of approximately 3 to 5 to obtain the allowable stresses in Figures HBB-I-14.4A-E, the staff is concerned that allowing extrapolation as permitted by HGB-3224(d) could result in nonconservative t_{ib} values. Therefore, the staff finds HGB-3224 acceptable with the following limitation: • When extrapolating t_{ib} using Figures HBB-I-14.4A through HBB-I-14.4E to obtain t_{ib} in accordance with HGB-3224(d), the maximum t_{ib} value for any stress and temperature combination should not exceed 300,000 hours or the end of the curve for the temperature of interest*, whichever is less.*	Restricting extrapolation for a component with a specified 300,000-hour design life at elevated temperature results in a use-fraction of greater than or equal to 1.0 regardless of the specified Service Loadings; this would occur because the denominator in the use-fraction summation would always be less than or equal to 300,000 hours. To achieve a time fraction of 1.0 in this case, all Service Level A, B, and C loadings would be required to have a stress less than or equal to S_t at 300,000 hours at the appropriate temperature, even if the Service Loading duration was much shorter, with higher stresses permitted by HGB-3224(c) equation (10). The most significant contributors to the use-fraction summation will be Service Loadings where the stresses are relatively high, and the allowable times have limited or no extrapolation. The Code margins for these Service Loadings are not at risk of being degraded by extrapolation. Lower stress Service Loadings, where t_{ib} is extrapolated to longer times, would be smaller overall contributions to the use-fraction summation since the total duration of all elevated temperature service loadings is limited to the time associated with S¬mt. Since the low stress Service Loadings would have small overall contribution to the use-fraction, extrapolation error in these cases would not have a significant impact on the overall margins.
4. Appendix A – General Comment	There are numerous places within Appendix A that are inconsistent with 10 CFR 50.69.	See comments below for specific examples of where Appendix A is inconsistent with 10 CFR 50.69.
5. A-2, Safety Classification	It is important to point out that in RG1.26 Quality Group D is applied only to "*water- and steam-containing*	The first two full paragraphs should be combined into one paragraph and re-written as shown below.

Affected Section	Comment/Basis	Recommendation
Categories – Traditional Approach, Page 19 of 26, Paragraphs 1 & 2	*components that are not part of the reactor coolant pressure boundary or included in Quality Groups B or C but are part of systems or portions of systems that contain or may contain radioactive material*".	Proposed New paragraph: SSCs that are NSR may function to prevent a radiological release to the public by ensuring that no dose to the public is beyond the regulatory limits of 0.1 rem total effective dose equivalent (TEDE) set by 10 CFR Part 20, "Domestic Licensing of Production and Utilization Facilities," (Ref. A-5). While such SSCs do not meet the criteria for an SR SSC, there is still a need to ensure component integrity. RG 1.26 assigns Quality Group D to components that contain or may contain radioactivity but are not part of the reactor coolant pressure boundary or included in Quality Groups B or C. Refer to RG 1.26 for more information on this traditional approach. RG 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants," (Ref. A-10) provides information related to the classification of radioactive waste management systems that fall within the scope of that RG. SSCs that are NSR and do not meet the criteria for special treatment are left to the applicant to specify any standards for design and fabrication.
6. A-2, Safety Classification Categories – Traditional Approach, Page 19 of 26, last full paragraph	Last full paragraph states: "*NSR mechanical components that need special treatment, such as for systems containing high levels of radioactive material…"*	Change to: "NSR mechanical components that ~~need special treatment, such as for systems~~ contain~~ing~~ high levels of radioactive material…" as this part of section A-2 only applies to the "Traditional Approach" for Safety Classification Categories.

Affected Section	Comment/Basis	Recommendation
7. A-2, Safety Classification Categories – Risk Informed Approach, Page 20 of 26, Paragraph 2	Second full paragraph is inconsistent with 10 CFR 50.69.	Needs to be re-written so that for RISC-2 components the owner has the flexibility allowed by 10 CFR 50.69 and that for RISC-3 components, Section III and Appendix B are not required.
8. Pages 22 & 23 (A-4, Quality Group Classifications)	Should be re-written to be consistent with 10 CFR 50.69 (i.e., for Group B and C the owner defines these requirements). For Group B the owner also needs to provide "reasonable confidence." For Group C, the "requirements" need to be consistent with the categorization process.	Should be re-written to be consistent with 10 CFR 50.69 (i.e., for Group B and C the owner defines these requirements). For Group B the owner also needs to provide "reasonable confidence." For Group C, the "requirements" need to be consistent with the categorization process.
9. Page 24 (Table A-1, Classification and Standards Applicable to Advanced Reactors for Quality Groups A, B, C, and D)	Should be re-written to be consistent with 10 CFR 50.69 (i.e., for Group B and C the owner defines these requirements / applicable codes and standards). For Group B the owner also needs to provide "reasonable confidence." For Group C, the "requirements" need to be consistent with the categorization process.	Should be re-written to be consistent with 10 CFR 50.69 (i.e., for Group B and C the owner defines these requirements / applicable codes and standards). For Group B the owner also needs to provide "reasonable confidence." For Group C, the "requirements" need to be consistent with the categorization process.
10. Appendix A (Table A-1)	Table A-1 is not consistent with 10 CFR 50.69. The interpretation of Table A-1 is such that the user is required to use the codes and standards as defined in the table for the specified quality groups. However, there may be alternative design and construction codes Class A and B applicable and acceptable for Quality Group A, B, C and D components.	Table A-1 should be re-written.

NEI/Industry Comments on NUREG-2245

Affected Section	Text	Comment/Recommendation
1. NUREG-2245 3-107 lines 16-20	The NRC staff is not endorsing Mandatory Appendix HBB-I-14 for: (a) Type 304 stainless steel (Type 304 SS) values of Smt, St, and Sr for temperatures greater than 1300 °F or 700 °C.	As the basis for the above restriction, NUREG-2245 Sections 3.7.5, 3.7.6, and 3.7.9 utilized comparisons in ANL/AMD-21/1, Tables 3 and 4. The staff proposed a cutoff at temperatures where the difference is -10% or greater. Review of Tables 3 and 4 of ANL/AMD-21/1 indicates that typically the difference does not reach -10% until longer times, for example at 725°C St in Table 3 does not drop below the 10% criteria until 100,000 hours. Has the staff considered use of both temperature and time to set this limit and allow short duration conditions at temperatures greater than 1300 °F or 700 °C, where the 2017 Code allowable stresses meet the 10% criteria?
2. NUREG-2245 3-107 lines 21-22	The NRC staff is not endorsing Mandatory Appendix HBB-I-14 for: (b) Type 316 stainless steel (Type 316 SS) Sr values for temperatures greater than 1300 °F or 700 °C.	As the basis for the above restriction, NUREG-2245 Section 3.7.9 utilized comparisons in ANL/AMD-21/1 Table 6. The staff proposed a cutoff at temperatures where the difference is -10% or greater. Review of Tables 6 of ANL/AMD-21/1 indicates that typically the difference does not reach -10% until longer times, for example, at 725°C Sr in Table 6 does not drop below the 10% criteria until 1,000 hours. Has the staff considered use of both temperature and time to set this limit and allow short duration conditions at temperatures greater than 1300°F or 700°C, where the 2017 Code allowable stresses meet the 10% criteria?

Affected Section	Text	Comment/Recommendation
3. NUREG-2245 3-107 lines 24-25	The NRC staff is not endorsing Mandatory Appendix HBB-I-14 for: (c) 2-1/4Cr-1Mo material Smt, St, and Sr values for temperatures greater than 950 °F or 510°C.	As the basis for the above restriction, NUREG-2245 Sections 3.7.5, 3.7.6, and 3.7.9 utilized comparisons in ANL/AMD-21/1, Tables 10 and 11 and Figure 4. Review of Tables 10 and 11 indicates that the 2017 Code allowable stresses were conservative at 100,000 hours up to 550°C. Has the staff considered use of both temperature and time to set this limit and allow short duration conditions at temperatures greater than 950 °F or 510°C?