NRC Abstention on ASME Section III Ballot 31-2109RC1

Overview

The NRC is abstaining from voting on ballot 23-2109RC1. This abstention is primarily due to the need for the NRC to devote additional time towards evaluating the merits of introducing rules from industrial codes and standards into Section III through the proposed Code Case. The NRC appreciates the responses that were initially provided to the disapproval of ballot 23-2109. However, as noted above, more time is required to fully evaluate the responses to certain comments. Specific areas of interest that the NRC is continuing to evaluate are outlined below. The NRC expects that these issues will be addressed in a future revision to the record. If additional revisions are not made, it is possible that the NRC could register a vote of disapproval should the record reach the Section III main committee and/or the NRC would condition the use of the Code Case as part of a future endorsement of more recent updates to the rules in Section III Division 5.

Specific Comments

1. The NRC is concerned that selectively mixing discrete portions of industrial codes with the rules of Section III (e.g., Section III for design in combination with an industrial construction code for NDE and testing) provides an overall approach that <u>does not provide reasonable confidence that sufficient safety margins are maintained</u>. Section III includes higher design allowables that provide reduced margin compared to industrial codes. This is generally offset by increased NDE, material, and quality assurance rules. However, this Code Case would combine the generally reduced design margins associated with Section III with reduced NDE and testing rules from industrial codes. **On this topic as a whole**, the NRC considered the response to comment 6 of the negative vote on ballot 23-2109 inadequate.

   Reply: The alternate rules provided in this Case may only be used when there is agreement between the Owner and regulating authority that a component or system is of minimal contribution to safety or risk. We believe that Section III design rules combined with the alternate construction rules proposed in this Case is risk-appropriate for this scope of items.

   Regulatory Guide 1.87, Revision 2 links safety classifications from industry standards like 10CFR50.69 and NEI 18-04 to applicable minimum requirements for construction. Per Table A-1 of the Regulatory Guide, items that are NSRST or RISC-2 and RISC-3 may be entirely constructed to existing industrial codes (with no nuclear code requirements). We propose using nuclear codes with select alternate construction requirements that are consistent with NRC accepted industrial standards.

   Our understanding of the NRC's fundamental concern is that using Section III design rules in combination with alternate construction rules (aligned with industrial codes) will result in components that have lower safety and reliability margins than components constructed solely to industrial codes because Section III has higher design allowables. The NRC states that the higher Section III design allowables are only acceptable because of 1) increased NDE, 2) strict material rules, and 3) nuclear QA rules.

   We agree that Section III provides lower margins due to the use of Service Levels and this is a significant difference between nuclear and industrial codes. This is one of the main incentives for the Code Case, rather than just using industrial Codes. However, as discussed below, we do not agree that Service Limits are acceptable only because of NDE, Materials and QA. Our basis is provided below.

The Section III Service Limits are determined as multipliers on the basic allowable stresses (e.g., S, S_m from Tables 1-4 in Section II, Part D). The multiplier for each Service Level is selected based on the frequency of the event under consideration (e.g., a lower multiplier is used for Service Level B because those events are expected to happen more frequently than a Service Level D event). The multiplier considers the margin to the failure point. The failure point is defined as the development of plastic hinges and collapse mechanisms of continuously supported pipe at supports or mid-span of supports without consideration for the location of welds, as established in the Code Case technical basis document.

A conclusion that NDE or material requirements were part of the basis for establishing Service Limits is not supported by the published technical basis document (WRC Bulletin 367) written at that time. While we agree that NDE, material and other requirements of Section III are clearly important, the Service Limits established in the Code are independent of material or NDE requirements. This position is supported by the current implementation and use of Service Levels within the Code as discussed below.

- Essentially the same Service Level multipliers are used for Code Classes 1, 2 and 3, even though the material and NDE requirements for these Code Classes vary considerably. Therefore, Service Limits are not dependent on either material requirements (beyond specifying which materials are permitted) or NDE.
    - There are no proposed changes to the permitted materials or requirements that ensure ductility or toughness of material (e.g., use of SA Specifications, heat treatments, NDE of the material, or ductility requirements) in Article -2000. The different levels of material testing and NDE allow for a choice of rules that provide assurance of safe operation, structural integrity, and quality commensurate with the relative importance of an item (see NCA-2120). The proposed Code Case provides alternate methods for NDE and testing of an item commensurate with its importance to safety or risk.
- The base design allowable stresses for a material (grade and product form) for ASME nuclear codes are the same as ASME industrial codes[1]. ASME Code allowable stresses are differentiated by Division/Class, they are not differentiated by nuclear vs industrial codes. We note that there are higher base allowable stresses for Section III, Class 1, but these same higher allowable stresses are also permitted for Section VIII, Division 2 based on the design analysis (design by analysis opposed to design by rule) and by increased volumetric examination requirements (use of UT as an acceptable volumetric examination approach is discussed further in response 2). Because the allowable stress tables are the

[1] Classes 2/3, Section I, Section VIII, Division 1, and B31.1 all use the *same allowable stress* Tables 1A/B and 3 of Section II Part D. Further, Section III, Class 1 and Section VIII, Division 2, both use the *same allowable stress* Tables 2A/B and 4 of Section II Part D.

same for industrial and nuclear codes and there is no discussion of nuclear quality assurance in the historical basis for establishing service limits, there is no basis to conclude that Nuclear QA requirements are required to use Service Levels.

In conclusion, the published basis for Service Levels is the frequency of events and not NDE, materials, or quality assurance, which is further demonstrated by a review of the Service Limits by Class. The design margins with respect to Service Limits are unchanged by this Code Case and are, therefore, appropriate for items with minimal contribution to safety or risk.

Within the context of mixing Section III design rules with alternate requirements, the NRC provides more specific comments and concerns that are discussed below:

a. Concerning the response to NRC comment number 2, the specific questions were not answered other than stating that ultrasonic testing is permitted in industrial standards. For example, there was no specific technical basis provided for leaving in construction defects which are more vulnerable to high temperature degradation (e.g., creep). Additionally, no discussion was provided regarding how UT examination would be able to distinguish between planar and volumetric flaws, given that the acceptance criteria specify cracks, porosity, and lack of fusion, which are difficult to distinguish using UT.

Reply: We acknowledge that there is not industry agreement on the ability to interchange UT and RT and the ASME and NRC are continuing this discussion within the context of traditional safety related LWR applications. However, for many years industrial codes have permitted the use of UT for volumetric examinations. These Codes have demonstration and acceptance criteria that have been successfully used in industrial applications. This Code Case does not permit leaving construction defects in service. Section VIII, B31.1 and B31.3 all permit UT and all permit operating temperatures in the creep regime. The requirements in this Code Case are aligned with these industrial code requirements. For items with minimal contribution to safety or risk, the NRC has accepted the use of the industrial standards. We believe that the non-nuclear operating experience from users of these Codes is an acceptable basis for applying these rules to items with a minimal contribution to safety or risk. (Note that in the response to Comment 1 we have demonstrated that Service Limits are not based on volumetric NDE).

b. Concerning the response to NRC comment number 3, the specific questions were not answered other than stating that the proposed random sampling method is permitted by industrial standards. In addition, the response stated that ASME B31.3 paragraph 341.4 allows random sampling, which includes high temperature application. However, ASME B31.3 paragraph 341.4 specifies many levels of examinations for many service levels, including 100% UT or RT of all completed welds, UT or RT of all welds in high cyclic conditions, and surface examination of socket and branch connection welds for elevated temperature fluid service. Therefore, B31.3

allows random sampling in addition to other examination requirements for various applications. The random sample in B31.3 is denotated as “Other Examination” and “when required” which would be in addition to the previous examinations mentioned above. Therefore, B31.3 would require more than just a 5% random sample (and also provides requirements on how to perform the random sample).

Reply: For normal fluid service, B31.3 requires 100% visual examination of all welds and 5% progressive sampling for volumetric examination (RT/UT). Other fluid service levels require additional volumetric and/or surface examinations. The basis for this Code Case is limited to normal fluid service because the Case is limited to moderate energy piping systems with minimal contributions to safety or risk.

NCD-5200 (as referenced by HCA-1110(b) and HCB-1110(b)) does not provide explicit visual examination requirements or acceptance standards. 100% surface examination requirements will be added to Annex B of this Case to better align with and exceed the B31.3 100% visual examination requirement.

c. Concerning the response to NRC comment number 4, no justification (i.e., data or experience) was provided for the reduced holding times beyond a statement that the hold times are sufficient. EPRI report 3002023907, “Alternate Requirements for Construction of ASME Section III Division 5 Components Commensurate with their Contribution to Safety and Risk,” (i.e., the basis document) states, “Section III Certificate Holder experience has shown that essentially no valves fail during the additional hold time past the required B16.34 holding times.” This experience and the data supporting this statement in the EPRI report should be provided as a technical basis.

Reply: Two major nuclear valve vendors were formally consulted for the EPRI technical basis report, in addition to numerous interactions with ASME WG Valve members. Valve vendors indicated there are *no instances* that anyone could recall of a valve failing a shell hydrotest after the required B16.34 hold time and before 10 minutes. There is no data kept by industry, as there is no reason to collect and document failures that have not occurred.

2. Since the responses to the NRC comments 1, 5, 7, and 8 on ballot 23-2109 stated that these issues are beyond the scope of Section III and are subject to the regulatory authority and the Owner, the NRC anticipates placing conditions on the use of the Code Case to address these issues, as appropriate. The issues include methodologies used to categorize structures, systems, and components, inservice inspection and testing, including monitoring of sensitive parameters for these risk-informed applications, repair/replacement requirements, and system designation and interactions, including probabilistic risk assessment to risk-inform these and similar applications.

Reply: The committee cannot address items beyond the scope of Section III. The committee understands the NRC's position which must be addressed by the Owners or others within the advanced reactor community if conditions are placed on the use of these rules.

3. The NRC also notes that no formal feedback has yet been provided from WG-Valves. The NRC will evaluate feedback received the committee's review and comment on the ballot.

Reply: WG Valves has been included on the recirculation review and comment ballot. Three members of WG Valves provided comments on the first consideration ballot which have been considered. We have also received feedback through WG Valves member attendance/engagement at the Task Group on Alternate Requirements and email exchanges with the WG, and we presented to WG Valves about the initial alternate requirements strategy (which included the proposed alternate hold times). Therefore, we believe that WG Valves has been included in the consensus process.