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Safety Related Concrete Structures for Nuclear Power Plants (Other than Reactor Vessels and Containments), DG-1283

Comment On: NRC-2019-0100-0001

Safety Related Concrete Structures for Nuclear Power Plants (Other Than Reactor Vessels and Containments)

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Submitter Information

Name: Anthony Ponko

General Comment

The regulatory guide should provide guidance on the welding of reinforcing bars in Seismic Category I concrete structures.

Specifically, that welding of reinforcing bars should comply with paragraph CC-4334 of ASME B&PV Code, Section III, Division 2 (ACI 359-15). This position would align with the guidance provided in NUREG-0800.

Seismic Category I concrete structures inside and outside of containment fall within the scope of NUREG-0800, Sections

3.8.3, Concrete and Steel Internal Structures of Steel or Concrete Containments, and 3.8.4, Other Seismic Category I

Structures, respectively. These structures are typically designed and constructed in accordance with ACI 349.

NUREG-0800, Section 3.8.4.I.6(B), Revision 4 September 2013 states: If welding of reinforcing bars is used, it should

comply with American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code (Code) Section III,

Division 2, . Any exception to compliance should be supported with adequate justification. Similar guidance is provided

in NUREG-0800, Section 3.8.3.I.6(B). This guidance was formerly provided in Regulatory Position C.4 of Regulatory Guide

1.94, Revision 1. These requirements were subsequently incorporated into ASME NQA-2.

ACI 349-13 adopts by reference AWS D1.4:2005 for the welding of reinforcing bars. There is a lot of commonality between AWS D1.4 and ASME BP&V Code, Section III, Division 2. In fact, ASME B&PV Code, Section III, Division 2, Mandatory Appendix D2-XIII references AWS D1.4 in some sections. The focus of AWS D1.4, however, is not nuclear safety-related construction. It is a code with a broad range of applicability. When used for a specific application such as the welding of reinforcing bars in Seismic Category I concrete structures, the applicable requirements of AWS D1.4 should be clearly specified and, if necessary, supplemented with other measures. ACI 349, however, does not adequately address the use of AWS D1.4 for the welding of reinforcing bars in Seismic Category I structures. For example, AWS D1.4 does not specify the appropriate types of inspections for a specific application of the code. It would seem reasonable to expect ACI 349 to address this issue, but it does not. This gap can be closed by endorsing ASME BP&V Code, Section III, Division 2 for the welding of reinforcing bar splices in Seismic Category I concrete structures. ASME BP&V Code, Section III, Division 2 requires destructive and nondestructive testing of production splices to verify tensile and weld quality requirements, respectively. These continuing performance tests are comparable to those endorsed for mechanical splices in Regulatory Position 2.2 of DG-1283. There is more potential variability in the quality of welded splices than mechanical splices. The types of inspections performed to verify welded splices meet performance and quality requirements in Seismic Category I concrete structures should at least be equal to those required for mechanical splices.

Endorsement of ASME BP&V Code, Section III, Division 2 requirements for the welding of reinforcing bars would also align with NRC staff implementation of NUREG-0800 guidance in the design certification of the Economic Simplified Boiling-Water Reactor (ESBWR) Standard Design.

Concerning the use of welded reinforcing bar splices in areas other than containment, NRC staff made the following comment in NUREG-1966, Final Safety Evaluation Report Related to the Certification of the Economic Simplified Boiling-Water Reactor Standard Design:

The staff noted that the applicants proposed DCD Tier 2, Section 3.8.4.6 referenced only ACI 349-01 and applicable RGs for splices. SRP Section 3.8.4.I.6 requires that the welding of reinforcing bars (splices) comply with the applicable sections of ASME Code, Section III, Division 2. The staff's position is that welding of reinforcing bars should comply with all the applicable sections of ASME Code, Section III, Division 2. This position applies to all seismic Category I

concrete structures
inside and outside containment.