

REGULATORY ANALYSIS

DRAFT REGULATORY GUIDE DG-1372 DESIGN LIMITS, LOADING COMBINATIONS, MATERIALS, CONSTRUCTION AND TESTING OF CONCRETE CONTAINMENTS (Proposed Revision 4 of Regulatory Guide 1.136, dated March 2007)

1. Statement of the Problem

The U.S. Nuclear Regulatory Commission (NRC) is considering revising Regulatory Guide 1.136 to update references to the most recent applicable consensus standard, namely the 2019 Edition of the ASME Boiler and Pressure Vessel Code, Section III, Division 2 (ACI 359) or ASME Code, and related NRC guidance and review practices for materials, design, construction, fabrication, examination and testing of concrete (reinforced or prestressed) containments for nuclear power plants.

The NRC published Revision 3 of Regulatory Guide 1.136, "Design Limits, Loading Combinations, Materials, Construction and Testing of Concrete Containments," in March 2007 to provide licensees and applicants with agency-approved guidance for complying with the requirements of General Design Criteria 1, 2, 4, 16 and 50 specified in Appendix A to 10 CFR Part 50 with regard to materials, design, construction, fabrication, examination and testing of concrete (reinforced or prestressed) containments in nuclear power plants. The current Revision 3 of RG 1.136 endorsed, with exceptions and clarifications, the 2001 Edition with 2003 Addenda of the ASME Code, Section III, Division 2. The current version of RG 1.136 does not reflect the concrete technology developments and significant changes that have progressively occurred since the 2004 edition through the most recent 2019 edition of the ASME Code, Section III, Division 2 that improve safety and construction efficiency. The significant changes include updated concrete material and mix design provisions for resistance to alkali-silica reaction and improved durability; incorporation of more recent material standards for reinforcing steel; new design provisions requiring radial tension reinforcement in portions of prestressed concrete containment susceptible to delamination; provisions allowing use of mechanically headed deformed bar anchorages, and additional types of mechanical splices for reinforcement which improve constructability and safety.

2. Objective

The objective of this regulatory action is to update NRC guidance and provide applicants with a method to demonstrate compliance with the General Design Criteria 1, 2, 4, 16 and 50 specified in Appendix A to 10 CFR Part 50 with regard to materials, design, construction, fabrication, examination, and testing of concrete (reinforced or prestressed) containments in nuclear power plants consistent with the most recent edition of the applicable national consensus standards.

Revising this regulatory guide to endorse portions of a consensus standard is consistent with the NRC policy of evaluating the latest versions of national consensus standards to determine their suitability for endorsement by regulatory guides. This approach also will comply with the NRC's Management Directive (MD-6.5) – "NRC Participation in the Development and Use of Consensus Standards" (ADAMS Accession No. ML18073A164). This is in accordance with Public Law 104-113, "National Technology Transfer and Advancement Act of 1995."

3. Alternative Approaches

The NRC staff considered the following alternative approaches:

1. Do not revise Regulatory Guide 1.136
2. Withdraw Regulatory Guide 1.136
3. Revise Regulatory Guide 1.136 to address the current methods and procedures.

Alternative 1: Do Not Revise Regulatory Guide 1.136

Under this alternative, the NRC would not revise or issue additional guidance, and the current guidance would be retained. This alternative is considered the “no-action” alternative and provides a baseline condition from which any other alternatives will be assessed. If NRC does not take action, there would not be any changes in costs or benefit to the public, licensees or NRC. However, the “no-action” alternative would not address identified concerns with the current version of the regulatory guide which endorses, with exceptions and clarifications, the 2001 Edition with 2003 Addenda of the ASME Code, Section III, Division 2, and it does not address the significant changes that have occurred in code provisions between the 2003 Addenda and the most recent 2019 edition. Therefore, without an update of the RG there is greater likelihood for the need for the staff to request additional information from applicants with a subsequent burden on applicants to respond to those requests.

Alternative 2: Withdraw Regulatory Guide 1.136

Under this alternative the NRC would withdraw this regulatory guide. This would eliminate the problems identified above regarding the regulatory guide. It would also eliminate the only readily available description of the methods the NRC staff considers acceptable for demonstrating compliance with Appendix A to 10 CFR 50 and related regulatory requirements for the design, construction, fabrication, examination and testing of reinforced concrete and prestressed concrete containments for nuclear power reactors. Although this alternative would be less costly than the proposed alternative, it would impede the public’s accessibility to the most current regulatory guidance.

Alternative 3: Revise Regulatory Guide 1.136

Under this alternative, the NRC would revise Regulatory Guide 1.136. This revision would incorporate the latest information in the most recent edition (2019) of the ASME Code, Section III, Division 2 (ACI 359-19) and supporting standards, supporting NRC guidance, and review practices. By doing so, the NRC would ensure that the RG guidance available in this area is current, and accurately reflects the staff’s position.

The impact to the NRC would be the costs associated with preparing and issuing the regulatory guide revision. The impact to the public would be the voluntary costs associated with reviewing and providing comments to NRC during the public comment period. The value to NRC staff and its applicants would be the benefits associated with enhanced efficiency and effectiveness in using a common guidance document as the technical basis for license applications and other interactions between the NRC and its regulated entities.

Conclusion

Based on this regulatory analysis, the NRC staff concludes that revision of Regulatory Guide 1.136 is warranted. The action will enhance nuclear power reactor safety by adopting the most recent developments in concrete technology as reflected in the most recent edition of applicable consensus standards and related NRC guidance and review practices with regard to materials, design, construction, fabrication and testing of concrete (reinforced and prestressed) containments. It could also lead to cost savings for the industry, especially with regard to design and construction efficiencies for concrete containments in applications for standard plant design certifications and combined licenses.