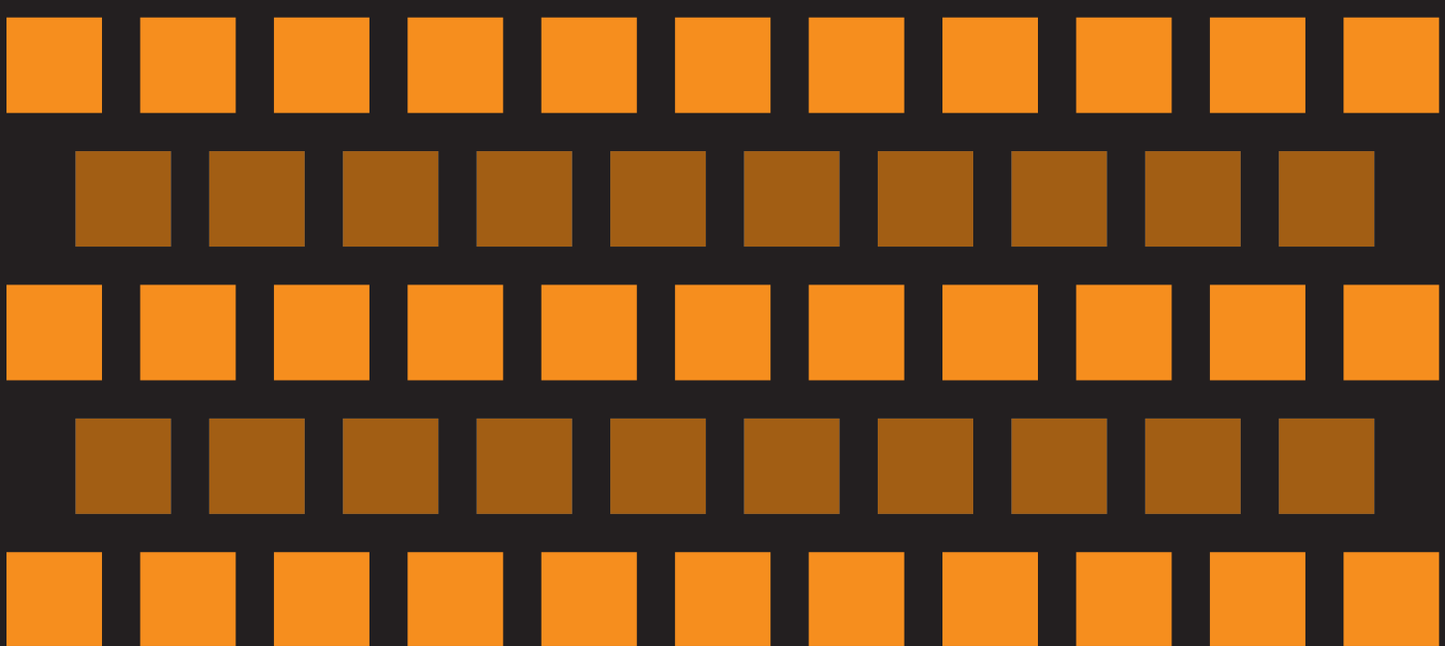
STP-NU-010

REGULATORY SAFETY ISSUES IN THE STRUCTURAL DESIGN CRITERIA OF ASME SECTION III SUBSECTION NH

For Very High Temperatures for VHTR & Gen IV



ASME STANDARDS TECHNOLOGY, LLC

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FOREWORD

This document is the result of work resulting from Cooperative Agreement DE-FC07-05ID14712 between the U.S. Department of Energy (DOE) and ASME Standards Technology, LLC (ASME ST-LLC) for the Generation IV (Gen IV) Reactor Materials Project. The objective of the project is to provide technical information necessary to update and expand appropriate ASME materials, construction, and design codes for application in future Gen IV nuclear reactor systems that operate at elevated temperatures. The scope of work is divided into specific areas that are tied to the Generation IV Reactors Integrated Materials Technology Program Plan. This report is the result of work performed under the regulatory safety area and is entitled "Regulatory Safety Issues in Structural Design Criteria of ASME Section III Subsection NH and for Very High Temperatures for VHTR & Gen IV."

ASME ST-LLC has introduced the results of the project into the ASME volunteer standards committees developing new code rules for Generation IV nuclear reactors. The project deliverables are expected to become vital references for the committees and serve as important technical bases for new rules. These new rules will be developed under ASME's voluntary consensus process, which requires balance of interest, openness, consensus and due process. Through the course of the project ASME ST-LLC has involved key stakeholders from industry and government to help ensure that the technical direction of the research supports the anticipated codes and standards needs. This directed approach and early stakeholder involvement is expected to result in consensus building that will ultimately expedite the standards development process as well as commercialization of the technology.

ASME has been involved in nuclear codes and standards since 1956. The Society created Section III of the Boiler and Pressure Vessel Code, which addresses nuclear reactor technology, in 1963. ASME Standards promote safety, reliability and component interchangeability in mechanical systems.

The American Society of Mechanical Engineers (ASME) is a not-for-profit professional organization promoting the art, science and practice of mechanical and multidisciplinary engineering and allied sciences. ASME develops codes and standards that enhance public safety, and provides lifelong learning and technical exchange opportunities benefiting the engineering and technology community. Visit www.asme.org.

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ABSTRACT

This Report: 1) identifies the safety issues relevant to the ASME Boiler and Pressure Vessel Code, including Section II, Section VIII, Section III Subsection NH (Class 1 Components in Elevated Temperature Service) and Code Cases that must be resolved in order to support licensing of Generation IV Nuclear Reactors, particularly Very-High-Temperature Gas-Cooled Reactors (VHTRs); 2) describes how Subsection NH addresses these issues; and 3) identifies the needs for additional criteria to cover unresolved safety concerns for very-high-temperature service.

The report also contains a description of the high-temperature structural integrity safety concerns raised by the U.S. Nuclear Regulatory Commission (NRC) and the Advisory Committee on Reactor Safeguards (ACRS) and how these issues are addressed in Subsection NH of the ASME Code.