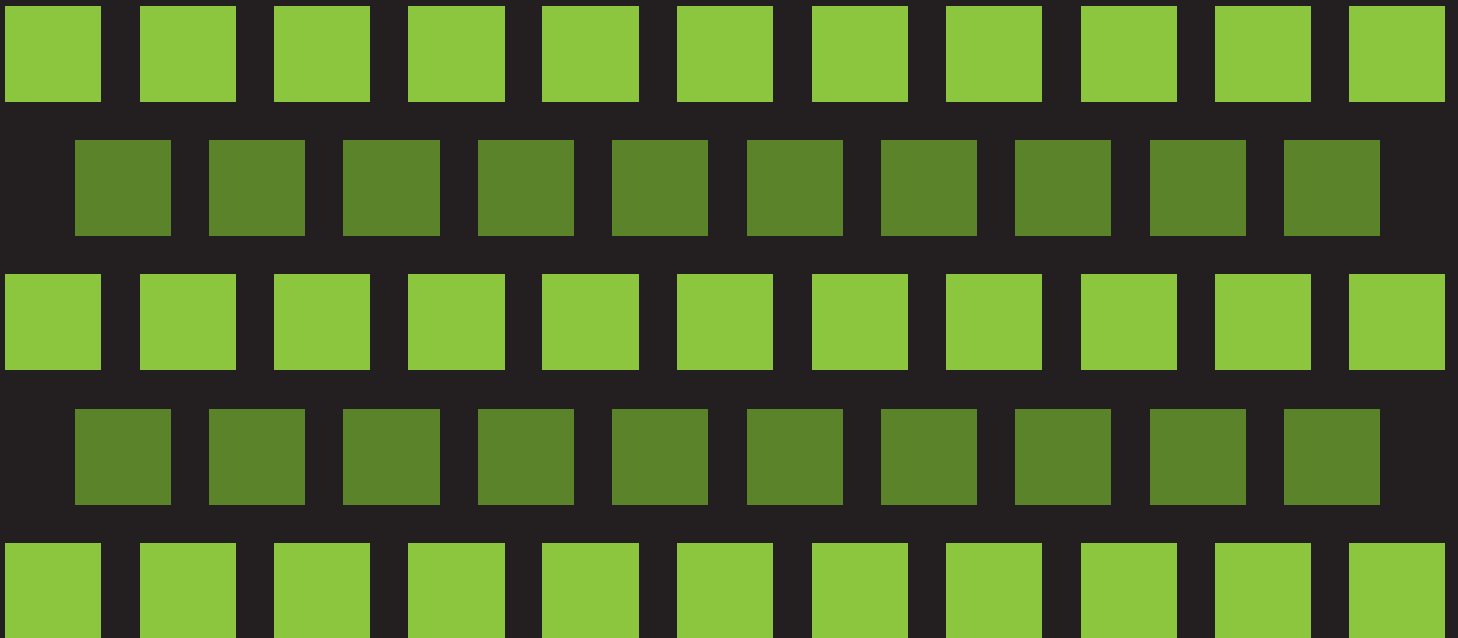


STP-PT-052

# ALIGN MECHANICAL AND CIVIL-STRUCTURAL EARTHQUAKE DESIGN AND QUALIFICATION RULES FOR ASME B31 PIPING SYSTEMS AND PIPELINES



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AND PIPELINES**

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## FOREWORD

This report provides recommendations for an improved interface between current seismic design, analysis and qualification codes and standards, as well as recommendations for improvements of these codes and standards, to achieve a consistent, complete, and non-redundant set of requirements and guidance for the design engineers.

Established in 1880, the American Society of Mechanical Engineers (ASME) is a professional not-for-profit organization with more than 127,000 members 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](http://www.asme.org) for more information.

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## ABSTRACT

The objective of this report is three-fold:

1. Conduct and document a literature search to obtain data on the performance (displacements, support and anchor loads, and failure) of piping subjected to earthquake motions. The document will present in a clear and structured format information concerning seismic performance of piping systems from experimental data and from high magnitude earthquake data on piping performance collected from post-earthquake investigation reports.
2. Provide recommendations for an improved interface between current seismic design, analysis and qualification codes and standards, as well as recommendations for improvements of these codes and standards, to achieve a consistent, complete, and non-redundant set of requirements and guidance for the design engineers.
3. Summarize U.S. seismic shake table test capabilities for piping components and piping systems.

The current situation regarding codes and standards for the seismic analysis and qualification of piping systems needs improvements. In Section 1 of this report, specific recommendations are made for improvement of the interface between ASCE, ASME, and MSS-SP and improvements within ASCE-7 and MSS-SP-127. These recommendations are intended to achieve a better fit between the codes and standards, and clarify their requirements.

A diagram depicts how the interface between ASCE, ASME, and MSS-Sp should work. Annex A outlines the contents of a good piping system seismic analysis and qualification procedure.

Section 2 documents experience in seismic testing of piping components and piping, and their performance in real earthquakes.

Section 3 summarizes capabilities for seismic shake table testing in the U.S.