STP/PT-003

HYDROGEN STANDARDIZATION INTERIM REPORT

For Tanks, Piping, and Pipelines

ASME STANDARDS TECHNOLOGY, LLC

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FOREWORD

Commercialization of fuel cells, in particular fuel cell vehicles, will require development of an extensive hydrogen infrastructure comparable to that which exists today for petroleum. This infrastructure must include the means to safely and efficiently generate, transport, distribute, store, and use hydrogen as a fuel. Standardization of pressure retaining components, such as tanks, piping, and pipelines, will enable hydrogen infrastructure development by establishing confidence in the technical integrity of products.

Since 1884, the American Society of Mechanical Engineers (ASME) has been developing codes and standards (C&S) that protect public health and safety. The traditional approach to standards development involved writing prescriptive standards only after technology has been established and commercialized. With the push toward a hydrogen economy, government and industry have realized that they cannot afford a hydrogen-related safety incident that may undermine consumer confidence. As a result, ASME has adopted a more anticipatory approach to standardization for hydrogen infrastructure which involves writing standards with more performance based requirements in parallel with technology development and before commercialization has begun.

Today, ASME codes and standards are used for hydrogen storage, transmission, and distribution. The anticipated requirements of the hydrogen economy will require local refueling stations with the capability to fill gaseous hydrogen vehicle tanks rapidly, to pressures as high as 10,000 psig. Although current standards could be used to build pressure vessels, piping, and pipelines meeting these operating requirements, it is likely that the resulting components would not, as a practical matter, enable commercialization of the technology.

ASME has worked closely with the Department of Energy (DOE), national laboratories, and other standards developing organizations (SDOs) to identify lead organizations to address the need for standards for hydrogen applications. ASME was selected to lead the efforts for pressure vessels, piping, and pipelines for storage, transportation, and distribution of hydrogen. Initial work of the ASME's Hydrogen Steering Committee led to the formation of volunteer task forces under the ASME Board on Pressure Technology Codes and Standards (BPTCS) to explore the standardization requirements for storage tanks, transportation tanks, portable tanks, piping, and pipelines for hydrogen-specific applications. The task forces submitted their recommendations at the end of 2003, and these recommendations led to initiation of standards actions, formation of project teams, and commencement of supporting research.

The ASME Boiler and Pressure Vessel (BPV) Standards Committee appointed a project team to develop new Code rules in the Boiler and Pressure Vessel Code Section VIII (pressure vessels) and Section XII (transport tanks) for hydrogen storage and transport tanks to be used in the storage and transport of liquid and gaseous hydrogen and metal hydrides. Rules for gaseous storage vessels with maximum allowable working pressures (MAWPs) up to 15,000 psig will be needed. Research activities are being coordinated to develop data and technical reports concurrent with standards development and have been prioritized per Project Team needs. The Project Team may identify additional needs and gaps as drafts are developed.

The Technical Reports to be developed will establish data and other information to be used to support and facilitate separate initiatives to develop ASME standards for the hydrogen infrastructure. These reports will target specific disciplines and fill the gaps identified by ASME's hydrogen task forces. This report is the first in a series of technical reports to be developed under sponsorship from the National Renewable Energy Laboratory (NREL) and addressing the following priority hydrogen infrastructure applications: