ASME NM.2-2022
(Revision of ASME NM.2-2020)

Fiber-Reinforced Thermosetting-Resin Piping Systems

ASME Standards for Nonmetallic Pressure Piping Systems

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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FOREWORD

In 2011, The American Society of Mechanical Engineers (ASME) established the Committee on Nonmetallic Pressure Piping Systems (NPPS) to develop standards for the construction of nonmetallic pressure piping systems. This Committee's goal was to specify construction* requirements for nonmetallic piping and piping products; such requirements were not adequately defined in existing standards.

Prior to the development of the ASME Standards for Nonmetallic Pressure Piping Systems, nonmetallic pressure piping requirements were contained within several existing standards. The nonmetallic piping requirements of the ASME B31 Code for Pressure Piping varied across Sections, with some Sections having no requirements for nonmetallic components at all. Other standards and codes, such as ASME RTP-1 and the ASME Boiler and Pressure Vessel Code (BPVC), Section X, included requirements for reinforced thermoset plastic (RTP) corrosion-resistant equipment but not for piping and piping components. ASME BPVC, Section III did have a few Code Cases that addressed requirements for some nonmetallic piping and piping components, including those made from glass-fiber-reinforced thermosetting resin and a few thermoplastics, e.g., high-density polyethylene (HDPE) and poly(vinyl chloride) (PVC). However, the scope of these Code Cases was very limited, and in some cases the methodology was nearly 30 years old. The ASME NPPS Standards now serve as a centralized location for NPPS requirements and are developed by committees whose members are experts in this field. The NPPS Committee's functions are to establish requirements related to pressure integrity for the construction of nonmetallic pressure piping systems, and to interpret these requirements when questions arise regarding their intent.

ASME NM.2 provides requirements for construction of FRP piping and piping components. This Standard addresses pipe and piping components that are produced as standard products, and custom products that are designed for a specific application. ASME NM.2-2018 (first edition) was approved by the American National Standards Institute (ANSI) on August 13, 2018.

ASME NM.2-2020 included revisions to Mandatory Appendix II that added example calculations, cautionary notes, and methods to compute classical lamination theory (CTE) of lamina and laminates. Additionally, Nonmandatory Appendix A was reorganized and revised, and section A-5 was added. Section A-5 includes a simplified stress analysis of a sample pipeline and illustrates the application of the design approach, equations, and physical properties of ASME NM-2 piping systems. Further, ASME NM.2-2020 revised and clarified figures, definitions, and nomenclature for ASME NM-2 piping systems.

ASME NM.2-2022 has been retitled "Fiber-Reinforced Thermosetting-Resin Piping Systems." The scope has been revised to include piping systems made of fiber-reinforced thermosetting resin (rather than specifically glass-fiber-reinforced thermosetting resin) or dual laminate. Various equations and variables have been revised to clarify meaning.

Following approval by the ASME NPPS Standards Committee, ASME NM.2-2022 was approved by the American National Standards Institute (ANSI) on December 5, 2022.

* *Construction*, as used in this Foreword, is an all-inclusive term comprising materials, design, fabrication, erection, examination, inspection, testing, and overpressure protection.

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Nonmetallic Pressure Piping Systems

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Revisions and Errata. The committee processes revisions to this Standard on a continuous basis to incorporate changes that appear necessary or desirable as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published in the next edition of the Standard.

In addition, the committee may post errata on the committee web page. Errata become effective on the date posted. Users can register on the committee web page to receive e-mail notifications of posted errata.

This Standard is always open for comment, and the committee welcomes proposals for revisions. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent background information and supporting documentation.

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(a) The most common applications for cases are

(1) to permit early implementation of a revision based on an urgent need

(2) to provide alternative requirements

(3) to allow users to gain experience with alternative or potential additional requirements prior to incorporation directly into the Standard

(4) to permit the use of a new material or process

(b) Users are cautioned that not all jurisdictions or owners automatically accept cases. Cases are not to be considered as approving, recommending, certifying, or endorsing any proprietary or specific design, or as limiting in any way the freedom of manufacturers, constructors, or owners to choose any method of design or any form of construction that conforms to the Standard.

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(1) a statement of need and background information

(2) the urgency of the case (e.g., the case concerns a project that is underway or imminent)

(3) the Standard and the paragraph, figure, or table number(s)

(4) the edition(s) of the Standard to which the proposed case applies

(d) A case is effective for use when the public review process has been completed and it is approved by the cognizant supervisory board. Approved cases are posted on the committee web page.

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Interpretations are published in the ASME Interpretations Database at http://go.asme.org/Interpretations as they are issued.

Committee Meetings. The NPPS Standards Committee regularly holds meetings that are open to the public. Persons wishing to attend any meeting should contact the secretary of the committee. Information on future committee meetings can be found on the committee web page at http://go.asme.org/NPPScommittee.

INTRODUCTION

The ASME Standards for Nonmetallic Pressure Piping Systems (NPPS) are as follows:

NM.1 Thermoplastic Piping Systems: This Standard contains requirements for piping and piping components that are produced using thermoplastic resins or compounds. Thermoplastics are a specific group of nonmetallic materials that, for processing purposes, are capable of being repeatedly softened by increase of temperature and hardened by decrease of temperature.

NM.2 Fiber-Reinforced Thermosetting-Resin Piping Systems: This Standard contains requirements for piping and piping components that are produced using fiber reinforcement embedded in or surrounded by cured thermosetting resin.

NM.3 Nonmetallic Materials: This Standard includes specifications for nonmetallic materials (except wood, nonfibrous glass, and concrete) and, in conformance with the requirements of the individual construction standards, methodologies, design values, limits, and cautions on the use of materials. This Standard is divided into three Parts:

- NM.3.1, Nonmetallic Materials, Part 1 — Thermoplastic Material Specifications: This Part contains thermoplastic material specifications identical to or similar to those published by the American Society for Testing and Materials (ASTM International) and other recognized national or international organizations.
- NM.3.2, Nonmetallic Materials, Part 2 — Reinforced Thermoset Plastic Material Specifications: This Part contains reinforced thermoset plastic material specifications identical to or similar to those published by ASTM and other recognized national or international organizations.
- NM.3.3, Nonmetallic Materials, Part 3 — Properties: This Part provides tables and data sheets for allowable stresses, mechanical properties (e.g., tensile and yield strength), and physical properties (e.g., coefficient of thermal expansion and modulus of elasticity) for nonmetallic materials.

It is the owner's responsibility to select the piping standard that best applies to the proposed piping installation. Factors to be considered by the owner include limitations of the standard, jurisdictional requirements, and the applicability of other standards. All applicable requirements of the selected standard shall be met. For some installations, more than one standard may apply to different parts of the installation. The owner is also responsible for imposing requirements supplementary to those of the standard if such requirements are necessary to ensure safe piping for the proposed installation.

Certain piping within a facility may be subject to other codes and standards, including but not limited to the following:

ASME B31.1, Power Piping: This code contains requirements for piping typically found in electric power generating stations, industrial and institutional plants, geothermal heating systems, and central and district heating and cooling systems.

ASME B31.3, Process Piping: This code contains requirements for piping typically found in petroleum refineries; onshore and offshore petroleum and natural gas production facilities; chemical, pharmaceutical, textile, paper, ore-processing, semiconductor, and cryogenic plants; food- and beverage-processing facilities; and related processing plants and terminals.

ASME B31.4, Pipeline Transportation Systems for Liquids and Slurries: This code contains requirements for piping transporting products that are predominately liquid between plants and terminals, and within terminals and pumping, regulating, and metering stations.

ASME B31.5, Refrigeration Piping and Heat Transfer Components: This code contains requirements for piping for refrigerants and secondary coolants.

ASME B31.8, Gas Transmission and Distribution Piping Systems: This code contains requirements for piping transporting products that are predominately gas between sources and terminals, including compressor, regulating, and metering stations; and gas gathering pipelines.

ASME B31.9, Building Services Piping: This code contains requirements for piping typically found in industrial, institutional, commercial, and public buildings, and in multi-unit residences, which does not require the range of sizes, pressures, and temperatures covered in ASME B31.1.