NFPA® 22

Standard for Water Tanks for Private Fire Protection

2023 Edition

NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471
An International Codes and Standards Organization

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NFPA® 22

Standard for

Water Tanks for Private Fire Protection

2023 Edition

This edition of NFPA 22, *Standard for Water Tanks for Private Fire Protection,* was prepared by the Technical Committee on Water Tanks. It was issued by the Standards Council on April 14, 2022, with an effective date of May 4, 2022, and supersedes all previous editions.

This edition of NFPA 22 was approved as an American National Standard on May 4, 2022.

Origin and Development of NFPA 22

In 1909, the NFPA Committee on Gravity Tanks developed the *Standard on Gravity Tanks.* Amendments were considered in 1912 and 1913, and the standard was adopted in 1914. Revised or amended editions were adopted in 1915, 1917, 1918, 1919, 1922, 1926, 1928, 1930, 1931, 1933, 1936, 1941, 1949, and 1950.

The name of the committee was changed to the Committee on Water Tanks, and its recommendations resulted in changes adopted in 1957, 1958, 1962, 1965, 1967, 1970, 1971, 1974, 1976, 1978, 1981, and 1987.

Tanks other than gravity tanks (which, at that time, included concrete reservoirs) and valve pits were first covered in 1913, pressure tanks (formerly covered by *Standards for Sprinkler Systems*) were covered in 1915, and tank heating was covered in 1922. The standard title has been periodically amended to reflect the expanded scope of the standard.

The 1993 edition provided new, environmentally friendly requirements for tank-coating systems. Two new chapters were included to cover the design and erection of bolted steel tanks and concrete tanks. Information on fiberglass tanks also was included. These changes, along with other editorial changes, reflected the current information for water storage tank design.

The 1996 edition of NFPA 22 consolidated tank care and maintenance information within a single chapter. Further revisions addressed the corrosion resistance of certain tank components, access into tanks, the monitoring of internal conditions, and the structural stresses to which tanks are subjected. The figures in Appendix B were revised to reflect current practices. Editorial changes were also made.

The 1998 edition further addressed environmental issues. All inspection, testing, and maintenance requirements were removed and added to the appropriate chapter of the 1998 edition of NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.*

The 2003 edition was changed to conform to the *Manual of Style for NFPA Technical Committee Documents*, 2000 edition. Referenced publications were updated.

The 2008 edition recognized the use of fiberglass-reinforced plastic (FRP) tanks with a new Chapter 11. Acceptance test requirements were consolidated into a new Chapter 17, "Acceptance Test Requirements," to improve user-friendliness.

The 2013 edition added sizing requirements for break tanks in Chapter 4 and sizing procedures for pressure tanks in the Chapter 7 annex material. The term *suction tank* was defined, and the requirements for anti-vortex plates were revised. Table 5.4 was updated to align with current industry standards.

The 2018 edition substantially modified Chapters 5 and 6. In Chapter 5 all duplicate requirements to AWWA D100 have been removed and reference to AWWA D100 has been made; requirements specific to fire protection remain in Chapter 5. In Chapter 6 all duplicate requirements to AWWA D103 have been removed and reference to AWWA D103 made; requirements specific to fire protection remain in Chapter 6. Requirements for check valves in the discharge pipe

of a suction tank have been clarified in Chapter 14, and tank repair requirements have been modified requiring the impairment procedures of NFPA 25 to be followed. Chapter 16 has added new criteria for electric immersion heaters, and the lowest one-day mean temperature map has been removed in lieu of using calculations to determine tank heating needs.

The 2023 edition was revised to remove redundant sections to provide clarity. Sections related to external loads, such as wind, snow, and live load requirements, have been updated to recognize other standards, and to replace outdated design approaches. Tank sizing requirements have been updated to ensure that pump suction pressure is considered when designing water tanks. Water tank construction features have been updated in line with newly referenced standards, and other applicable standards have been recognized by the standard. Additional valve requirements have been incorporated to improve maintainability. Fill line and suction pipe separation distances have been provided to prevent cavitation in the fire pump. Editorial corrections, such as unit conversions, were made where applicable. References have been updated to the latest applicable codes and standards.

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This list represents the membership at the time the Committee was balloted on the final text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of the document.

NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

Committee Scope: This Committee shall have primary responsibility for documents on the design, construction, installation, and maintenance of tanks and accessory equipment supplying water for fire extinguishment, including gravity and pressure tanks, towers and foundations, pipe connections and fittings, valve enclosures and frost protection, and tank heating equipment.

Contents

NFPA 22

Standard for

Water Tanks for Private Fire Protection

2023 Edition

NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

A reference in brackets [ ] following a section or paragraph indicates material that has been extracted from another NFPA document. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex C.

Chapter 1 Administration

1.1 Scope. This standard provides the minimum requirements for the design, construction, installation, and maintenance of tanks and accessory equipment that supply water for private fire protection, including the following:

(1) Gravity tanks, suction tanks, pressure tanks, and embankment-supported coated fabric suction tanks
(2) Towers
(3) Foundations
(4) Pipe connections and fittings
(5) Valve enclosures
(6) Tank filling
(7) Protection against freezing

1.2 Purpose. The purpose of this standard is to provide a basis for the design, construction, operation, and maintenance of water tanks for private fire protection.

1.3 Retroactivity. The provisions of this standard reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this standard at the time the standard was issued.

1.3.1 Unless otherwise specified, the provisions of this standard shall not apply to facilities, equipment, structures, or installations that existed or were approved for construction or installation prior to the effective date of the standard. Where specified, the provisions of this standard shall be retroactive.

1.3.2 In those cases where the authority having jurisdiction determines that the existing situation presents an unacceptable degree of risk, the authority having jurisdiction shall be permitted to apply retroactively any portions of this standard deemed appropriate.

1.3.3 The retroactive requirements of this standard shall be permitted to be modified if their application clearly would be impractical in the judgment of the authority having jurisdiction, and only where it is clearly evident that a reasonable degree of safety is provided.

1.4 Equivalency. Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard.

1.4.1 Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

1.4.2 The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

1.5 Types of Tanks. This standard addresses elevated tanks on towers or building structures, water storage tanks that are at grade or below grade, and pressure tanks.

Δ **1.5.1 Bladder Tanks Not Within the Scope of NFPA 22.** The following types of bladder tanks shall not be required to meet NFPA 22:

(1) Listed bladder tanks used as surge suppressors on the discharge side of fire pumps installed in accordance with NFPA 20
(2) Listed bladder tanks used as expansion tanks for antifreeze sprinkler systems installed in accordance with NFPA 13
(3) Bladder tanks used as foam concentrate tanks installed in accordance with NFPA 11

1.5.2 Bladder Tanks Within the Scope of NFPA 22. Bladder tanks shall be permitted to be a part of the water supply for a fire protection system when they meet the requirements for pressure tanks of this standard.

1.6 Units.

1.6.1 Metric units of measurement in this standard are in accordance with the modernized metric system known as the International System of Units (SI). The bar unit, which is outside of but recognized by SI, is commonly used in international fire protection. Metric units and their conversion factors are shown in Table 1.6.1.

Table 1.6.1 Metric Unit Conversion Factors

Name of Unit	Unit Symbol	Conversion Factor
bar	bar	1 psi = 0.0689 bar
bar	bar	1 bar = 10^5 Pa

Note: For additional conversions and information, see IEEE/ASTM SI 10.

1.6.2 If a value for measurement in this standard is followed by an equivalent value that is expressed in other units, the first stated value shall be regarded as the requirement. A given equivalent value could be approximate.

1.6.3 SI units in this standard have been converted by multiplying the number of units by the conversion factor and then rounding the result to the appropriate number of significant digits.

1.6.4 Where sizes for pipe, sheet and plate steel, and wire gages are indicated, they are noted in trade sizes and not by hard conversions.

N 1.7 New Technology.

N 1.7.1 Nothing in this standard shall be intended to restrict new technologies or alternate arrangements, provided the level of safety prescribed by this standard is not lowered.

N 1.7.2 Materials or devices not specifically designated by this standard shall be utilized in complete accord with all conditions, requirements, and limitations of their listings.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

Δ 2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 11, *Standard for Low-, Medium-, and High-Expansion Foam,* 2021 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 2022 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems,* 2023 edition.

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection,* 2022 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection,* 2022 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances,* 2022 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 2023 edition.

NFPA 70®, National Electrical Code®, 2023 edition.

NFPA 72®, National Fire Alarm and Signaling Code®, 2022 edition.

NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations,* 2022 edition.

NFPA 780, *Standard for the Installation of Lightning Protection Systems,* 2023 edition.

2.3 Other Publications.

2.3.1 ACI Publications. American Concrete Institute, 38800 Country Club Drive, Farmington Hills, MI 48331-3439.

ACI 318, *Building Code Requirements for Structural Concrete and Commentary*, 2019.

ACI 350, *Code Requirements for Environmental Engineering Concrete Structures*, 2006.

2.3.2 AISC Publications. American Institute of Steel Construction, 130 East Randolph Street, Suite 2000, Chicago, IL 60601.

ANSI/AISC 360, *Specification for Structural Steel Buildings*, 2019.

2.3.3 API Publications. American Petroleum Institute, 200 Massachusetts Avenue NW, Suite 1100, Washington, DC 20005-4070.

API SPEC 5L, *Specification for CRA Line Pipe*, 4th edition, 2018.

2.3.4 ASHRAE Publications. ASHRAE Inc., 180 Technology Parkway NW, Peachtree Corners, GA 30092.

ASHRAE *Handbook — Fundamentals*, 2017.

2.3.5 ASME Publications. American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990.

Boiler and Pressure Vessel Code, "Rules for the Construction of Unfired Pressure Vessels," 2021.

2.3.6 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM A36/A36M, *Standard Specification for Carbon Structural Steel*, 2019.

ASTM A53/A53M, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*, 2020.

ASTM A106/A106M, *Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service*, 2019a.

ASTM A108, *Standard Specification for Steel Bars, Carbon and Alloy, Cold-Finished, Standard Quality*, 2018.

ASTM A131/A131M, *Standard Specification for Structural Steel for Ships*, 2019.

ASTM A139/A139M, *Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and over)*, 2016.

ASTM A283/A283M, *Standard Specification for Low- and Intermediate-Tensile Strength Carbon Steel Plates*, 2018.

ASTM A285/A285M, *Standard Specification for Pressure Vessel Plates, Carbon Steel, Low- and Intermediate-Tensile Strength*, 2017.

ASTM A307, *Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod, 60,000 psi Tensile Strength*, 2014.

ASTM A502, *Standard Specification for Rivets, Steel, Structural* , 2015.

ASTM A516/A516M, *Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service*, 2017.

ASTM A675/A675M, *Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties*, 2019.

ASTM A992/A992M, *Standard Specification for Structural Steel Shapes*, 2020.

ASTM C578, *Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation*, 2019.