Tank Inspection, Repair, Alteration, and Reconstruction

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1 Scope

1.1 Introduction

1.1.1 This standard covers steel storage tanks built to API 650 and its predecessor API 12C. It provides minimum requirements for maintaining the integrity of such tanks after they have been placed in service and addresses inspection, repair, alteration, relocation, and reconstruction.

1.1.2 The scope is limited to the tank foundation, bottom, shell, structure, roof, attached appurtenances, and nozzles to the face of the first flange, first threaded joint, or first welding-end connection. Many of the design, welding, examination, and material requirements of API 650 can be applied in the maintenance inspection, rating, repair, and alteration of in-service tanks. In the case of apparent conflicts between the requirements of this standard and API 650 or its predecessor API 12C, this standard shall govern for tanks that have been placed in service.

1.1.3 This standard employs the principles of API 650; however, storage tank owner/operators, based on consideration of specific construction and operating details, may apply this standard to any steel tank constructed in accordance with a tank specification.

1.1.4 This standard is intended for use by organizations that maintain or have access to engineering and inspection personnel technically trained and experienced in tank design, fabrication, repair, construction, and inspection.

1.1.5 This standard does not contain rules or guidelines to cover all the varied conditions which may occur in an existing tank. When design and construction details are not given, and are not available in the as-built standard, details that will provide a level of integrity equal to the level provided by the current edition of API 650 must be used.

1.1.6 This standard recognizes fitness-for-service assessment concepts for evaluating in-service degradation of pressure containing components. API 579-1/ASME FFS-1, **Fitness-For-Service**, provides detailed assessment procedures or acceptance criteria for specific types of degradation referenced in this standard. When this standard does not provide specific evaluation procedures or acceptance criteria for a specific type of degradation or when this standard explicitly allows the use of fitness-for-service criteria, API 579-1/ASME FFS-1 may be used to evaluate the various types of degradation or test requirements addressed in this standard.

1.2 Compliance with This Standard

The owner/operator has ultimate responsibility for complying with the provisions of this standard. The application of this standard is restricted to organizations that employ or have access to an authorized inspection agency as defined in 3.3. Should a party other than the owner/operator be assigned certain tasks, such as relocating and reconstructing a tank, the limits of responsibility for each party shall be defined by the owner/operator prior to commencing work.

1.3 Jurisdiction

If any provision of this standard presents a direct or implied conflict with any statutory regulation, the regulation shall govern. However, if the requirements of this standard are more stringent than the requirements of the regulation, then the requirements of this standard shall govern.

1.4 Safe Working Practices

An assessment shall be made of the potential hazards to which personnel may be exposed when conducting internal tank inspections, making repairs, or dismantling tanks. Procedures shall be developed according to the
guidelines given in API 2015 and API 2217A that will include safeguard for personnel health and safety, prevention of accidental fires and explosions, and the prevention of property damage. Conformance to permit procedures is an essential safe work practice for protection of personnel and property. Where welding and hot work are involved, API 2009 states “Except in areas specifically designated as safe for hot work, a hot work permit shall be obtained before starting any work that can involve a source of ignition.” See also API Recommended Practice 2016.

Special procedures may need to be developed for certain activities described in this standard that are not fully covered by the referenced API publications; e.g. safety precautions for personnel accessing floating roof tanks that are in service, or gas freeing the bottom side of a tank. Appendix B of API 2009 provides brief information on inerting tanks. Use of inerting as a safety precaution should address personnel hazards introduced when using inert gas in the workplace and implementation should be done in consultation with specialists that are familiar with such processes. Finally, procedures must comply with any federal or state safety regulations pertaining to “confined spaces” or any other relevant provisions.
Section 2—References

2.1 Referenced Publications

The following standards, codes, publications, and specifications are cited in this standard. The latest edition or revision shall be used unless otherwise noted.

API Recommended Practice 579-1/ASME FFS-1, *Fitness-For-Service*

API Recommended Practice 580, *Risk Based Inspection*

API Standard 620, *Design and Construction of Large, Welded, Low-pressure Storage Tanks*

API Standard 650, *Welded Tanks for Oil Storage*

API Recommended Practice 651, *Cathodic Protection of Aboveground Storage Tanks*

API Recommended Practice 652, *Lining of Aboveground Petroleum Storage Tank Bottoms*

API Standard 2000, *Venting Atmospheric and Low-pressure Storage Tanks: Nonrefrigerated and Refrigerated*

API Recommended Practice 2003, *Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents*


API Standard 2015, *Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks*

API Recommended Practice 2016, *Guidelines and Procedures for Entering and Cleaning Petroleum Storage Tanks*

API Recommended Practice 2201, *Safe Hot Tapping Practices in the Petroleum and Petrochemical Industries*

API Recommended Practice 2207, *Preparing Tank Bottoms for Hot Work*


ASME *Boiler and Pressure Vessel Code (BPVC)* 1, *Section V: Nondestructive Examination*

ASME *BPVC, Section VIII: Pressure Vessels; Division 2: Alternative Rules*

ASME *BPVC, Section IX: Welding and Brazing Qualifications*

ASNT *SNT-TC-1A* 2, *Personnel Qualification and Certification in Nondestructive Testing*

ASTM A6 3, *Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling*

ASTM A20, *Standard Specification for General Requirements for Steel Plates for Pressure Vessels*

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2 American Society for Nondestructive Testing, 1711 Arlingate Lane, Columbus, Ohio, 43228-0518, www.asnt.org.
ASTM A36, Standard Specification for Carbon Structural Steel

ASTM A370, Standard Test Methods and Definitions for Mechanical Testing of Steel Products

ASTM A992, Standard Specification for Structural Steel Shapes

AWS D1.1 4, Structural Welding Code—Steel

AWS D1.6, Structural Welding Code—Stainless Steel

NACE Standard RP 0205-2005 5, Recommended Practice for the Design, Fabrication, and Inspection of Tanks for the Storage of Petroleum Refining Alkylation Unit Spent Sulfuric Acid at Ambient Temperatures

2.2 Other References

Although not cited in this standard, the following publication may be of interest.

API Standard 2610, Design, Construction, Operation, Maintenance, and Inspection of Terminal and Tank Facilities

ANSI/AWS Z49.1, Safety in Welding and Cutting and Allied Processes


5 NACE International (formerly the National Association of Corrosion Engineers), 1440 South Creek Drive, Houston, Texas 77218-8340, www.nace.org.