# Pressure Vessel Inspection Code: In-Service Inspection, Rating, Repair, and Alteration

API 510
NINTH EDITION, JUNE 2006


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**Downstream Segment**

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# FOREWORD

In December 1931, API and the American Society of Mechanical Engineers (ASME) created the Joint API/ASME Committee on Unfired Pressure Vessels. This committee was created to formulate and prepare for publication a code for safe practices in the design, construction, inspection, and repair of pressure vessels to be used in the petroleum industry. Entitled API/ASME Code for Unfired Pressure Vessels for Petroleum Liquids and Gases (commonly called the API/ASME Code for Unfired Pressure Vessels or API/ASME Code), the first edition of the code was approved for publication in 1934.

From its inception, the API/ASME Code contained Section I, which covered recommended practices for vessel inspection and repair and for establishing allowable working pressures for vessels in service. Section I recognized and afforded well-founded bases for handling various problems associated with the inspection and rating of vessels subject to corrosion. Although the provisions of Section I (like other parts of the API/ASME Code) were originally intended for pressure vessels installed in the plants of the petroleum industry, especially those vessels containing petroleum gases and liquids, these provisions were actually considered to be applicable to pressure vessels in most services. ASME's Boiler and Pressure Vessel Committee adopted substantially identical provisions and published them as a nonmandatory appendix in the 1950, 1952, 1956, and 1959 editions of Section VIII of the ASME Boiler and Pressure Vessel Code.

After the API/ASME Code was discontinued in 1956, a demand arose for the issuance of Section I as a separate publication, applicable not only to vessels built in accordance with any edition of the API/ASME Code but also to vessels built in accordance with any edition of Section VIII of the ASME Code. Such a publication appeared to be necessary to assure industry that the trend toward uniform maintenance and inspection practices afforded by Section I of the API/ASME Code would be preserved. API 510, first published in 1958, is intended to satisfy this need.

The procedures in Section I of the 1951 edition of the API/ASME Code, as amended by the March 16, 1954 addenda, have been updated and revised in API 510. Section I of the API/ASME Code contained references to certain design or construction provisions, so these references have been changed to refer to provisions in the ASME Code. Since the release of the 1960 edition of the National Board Inspection Code, elements of the API/ASME Code have also been carried by the National Board Inspection Code.

It is the intent of API to keep this publication up to date. All pressure vessel owners and operators are invited to report their experiences in the inspection and repair of pressure vessels whenever such experiences may suggest a need for revising or expanding the practices set forth in API 510.

This edition of API 510 supersedes all previous editions of API 510. Each edition, revision, or addenda to this API standard may be used beginning with the date of issuance shown on the cover page for that edition, revision, or addenda. Each edition, revision, or addenda to this API standard becomes effective 6 months after the date of issuance for equipment that is rerated, reconstructed, relocated, repaired, modified (altered), inspected, and tested per this standard. During the 6-month time between the date of issuance of the edition, revision, or addenda and the effective date, the user shall specify to which edition, revision, or addenda, and the equipment is to be rerated, reconstructed, relocated, repaired, modified (altered), inspected and tested.

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Generally, API standards are reviewed and revised, reaffirmed, or withdrawn at least every five years. A one-time extension of up to two years may be added to this review cycle. Status of the publication can be ascertained from the API Standards Department, telephone (202) 682-8000. A catalog of API publications and materials is published annually and updated quarterly by API, 1220 L Street, N.W., Washington, D.C. 20005.

Suggested revisions are invited and should be submitted to the Standards and Publications Department, API, 1220 L Street, NW, Washington, DC 20005, standards@api.org.

## INSTRUCTIONS FOR SUBMITTING A PROPOSED REVISION TO THIS STANDARD UNDER CONTINUOUS MAINTENANCE

This standard is maintained under API's continuous maintenance procedures. These procedures establish a documented program for regular publication of addenda or revisions, including timely and documented consensus action requests for revisions to any part of the standard. Proposed revisions shall be submitted to the Director, Standards Department, API, 1220 L Street, NW, Washington, D.C. 20005-4070, standards@api.org.

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# Pressure Vessel Inspection Code: In-Service Inspection, Rating, Repair, and Alteration

## 1 Scope

### 1.1 General Application

#### 1.1.1 Coverage

This inspection code covers the in-service inspection, repair, alteration, and rerating activities for pressure vessels and the pressure-relieving devices protecting these vessels. This inspection code applies to all refining and chemical process vessels that have been placed in service unless specifically excluded per 1.2.2. This includes:

a. vessels constructed in accordance with an applicable construction code
b. vessels constructed without a construction code (non-code)—A vessel not fabricated to a recognized construction code and meeting no known recognized standard
c. vessels constructed and approved as jurisdictional special based upon jurisdiction acceptance of particular design, fabrication, inspection, testing, and installation
d. non-standard vessels—A vessel fabricated to a recognized construction code but has lost it's nameplate or stamping.

The ASME Code and other construction codes are written for new construction; however, most of the technical requirements for design, welding, NDE, and materials can be applied to the inspection, rerating, repair, and alteration of in-service pressure vessels. If an item cannot follow the ASME Code because of its new construction orientation, requirements for design, material, fabrication, and inspection shall conform to API 510 rather than to the ASME Code. If in-service vessels are covered by requirements in the ASME Code and API 510 or if there is a conflict between the two codes, the requirements of API 510 shall take precedence. As an example of the intent of API 510, the phrase "applicable requirements of the ASME Code" has been used in API 510 instead of the phrase "in accordance with the ASME Code."

#### 1.1.2 Intent

The application of this inspection code is restricted to owner/users that employ or have access to the following technically qualified individuals and organizations:

a. An authorized inspection agency;
b. A repair organization;
c. An engineer;
d. An inspector; and,
e. Examiners.

Inspectors are to be certified as stated in this inspection code (see Appendix B). Since other codes covering specific industries and general service applications already exist (e.g. NB-23), the refining and petrochemical industry has developed this inspection code to fulfill their own specific requirements for vessels and pressure-relieving devices that fit within the restrictions listed in the scope.

#### 1.1.3 Limitations

Adoption and use of this inspection code does not permit its use in conflict with any prevailing regulatory requirements. However, if the requirements of this code are more stringent than the requirements of the regulation, then the requirements of this code shall govern.

### 1.2 Specific Applications

#### 1.2.1 Exploration and Production Vessels

All pressure vessels used for Exploration and Production (E&P) service [for example, drilling, producing, gathering, transporting, lease processing, and treating liquid petroleum, natural gas, and associated salt water (brine)] may be inspected under the alternative rules set forth in Section 9. Except for Section 6, all of the sections in this inspection code are applicable to pressure vessels in E&P service. The alternative rules in Section 9 are intended for services that may be regulated under safety, spill, emission, or transportation controls by the U.S. Coast Guard; the Office of Hazardous Materials Transportation of the U.S. Department of

Transportation (DOT) and other units of DOT; the Minerals Management Service of the U.S. Department of the Interior; state and local oil and gas agencies; or any other regulatory commission.

### 1.2.2 Excluded and Optional Services

The following are excluded from the specific requirements of this inspection code:

a. Pressure vessels on movable structures covered by other jurisdictional regulations (see Appendix A (a)).
b. All classes of containers listed for exemption in the scope of the applicable construction code (see Appendix A (b)).
c. Pressure vessels that do not exceed the volumes and pressures listed in Appendix A (c).

## 1.3 Recognized Technical Concepts

This inspection code recognizes fitness-for-service concepts for evaluating in-service damage of pressure-containing components. API 579 provides detailed assessment procedures for specific types of damage that are referenced in this code.

This inspection code recognizes risk-based inspection (RBI) concepts for determining inspection intervals. API 580 provides guidelines for conducting a risk-based assessment.