Inspection of Pressure Vessels (Towers, Drums, Reactors, Heat Exchangers, and Condensers)

RECOMMENDED PRACTICE 572
SECOND EDITION, FEBRUARY 2001

American Petroleum Institute

Helping You Get The Job Done Right.SM

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Downstream Segment

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FOREWORD

This recommended practice covers the inspection of pressure vessels. It is based on the accumulated knowledge and experience of engineers and other personnel in the petroleum industry.

The information contained in this publication was previously presented as Chapter VI and Chapter VII of the Guide for Inspection of Refinery Equipment. The information in this recommended practice does not constitute and should not be construed as a code of rules, regulations, or minimum safe practices. The practices described in this publication are not intended to supplant other practices that have proven satisfactory, nor is this publication intended to discourage innovation and originality in the inspection of refineries. Users of this recommended practice are reminded that no book or manual is a substitute for the judgment of a responsible, qualified person.

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Asbestos is specified or referenced for certain components of the equipment described in some API standards. It has been of extreme usefulness in minimizing fire hazards associated with petroleum processing. It has also been a universal sealing material, compatible with most refining fluid services.

Certain serious adverse health effects are associated with asbestos, among them the serious and often fatal diseases of lung cancer, asbestosis, and mesothelioma (a cancer of the chest and abdominal linings). The degree of exposure to asbestos varies with the product and the work practices involved.

Consult the most recent edition of the Occupational Safety and Health Administration (OSHA), U.S. Department of Labor, Occupational Safety and Health Standard for Asbestos, Tremolite, Anthophyllite, and Actinolite, 29 *Code of Federal Regulations* Section 1910.1001; the U.S. Environmental Protection Agency, National Emission Standard for Asbestos, 40 *Code of Federal Regulations* Sections 61.140 through 61.156; and the U.S. Environmental Protection Agency (EPA) rule on labeling requirements and phased banning of asbestos products (Sections 763.160-179).

There are currently in use and under development a number of substitute materials to replace asbestos in certain applications. Manufacturers and users are encouraged to develop and use effective substitute materials that can meet the specifications for, and operating requirements of, the equipment to which they would apply.

SAFETY AND HEALTH INFORMATION WITH RESPECT TO PARTICULAR PRODUCTS OR MATERIALS CAN BE OBTAINED FROM THE EMPLOYER, THE MANUFACTURER OR SUPPLIER OF THAT PRODUCT OR MATERIAL, OR THE MATERIAL SAFETY DATA SHEET.

CONTENTS

CONTENTS

CONTENTS

Inspection of Pressure Vessels (Towers, Drums, Reactors, Heat Exchangers, and Condensers)

1 Scope

This Recommended Practice (RP) covers the inspection of pressure vessels. It includes a description of the various types of pressure vessels and the standards for their construction and maintenance. The reasons for inspection, causes of deterioration, frequency and methods of inspection, methods of repair, and preparation of records and reports are covered. Safe operation is emphasized.

2 References

The latest editions of the following standards, codes, and recommended practices shall, to the extent specified herein, form a part of this recommended practice.

API

IRE, Chapter II	*Guide for Inspection of Refinery Equipment, Conditions Causing Deterioration or Failures (out of print; to be replaced by RP 571, currently under development)*
Std 510	*Pressure Vessel Inspection Code: Maintenance Inspection, Rating, Repair, and Alteration*
RP 574	*Inspection Practices for Piping System Components*
RP 575	*Inspection of Atmospheric and Low-Pressure Storage Tanks*
RP 576	*Inspection of Pressure-Relieving Devices*
RP 579	*Fitness-for-Service*
Std 660	*Shell-and-Tube Heat Exchangers for General Refinery Service*
Std 661	*Air-Cooled Heat Exchangers for General Refinery Services*
Publ 938	*An Experimental Study of Causes and Repair of Cracking of 1¼ Cr-½ Mo Steel Equipment*
Publ 939	*Research Reporting on Characterization and Monitoring of Cracking in Wet H_2S Service*
RP 941	*Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petroleum Plants*
RP 945	*Avoiding Environmental Cracking of Carbon Steels in Amine Units*
Publ 2214	*Spark Ignition Properties of Hand Tools*
Publ 2217A	*Guidelines for Work in Inert Confined Spaces in the Petroleum Industry*

ASME[1]

Boiler and Pressure Vessel Code, Section VIII, "Pressure Vessels"

NB[2]

NB-23	*National Board Inspection Code*

TEMA[3]

Standards of Tubular Exchanger Manufacturers Association

WRC[4]

Bulletin 411	*An Experimental Study of Causes and Repair of Cracking of 1¼ Cr-½ Mo Steel Equipment*

3 Definitions

For the purposes of this publication, the following definitions apply:

3.1 CUI: Corrosion under insulation, which includes stress corrosion cracking under insulation.

3.2 defect: In NDE usage, a defect is an imperfection of a type or magnitude exceeding the acceptable criteria.

3.3 inspector: An authorized pressure vessel inspector.

3.4 jurisdiction: A legally constituted government administration that may adopt rules relating to pressure vessels.

3.5 on-stream: Pressure vessels containing any amount of process fluid.

3.6 PT: Liquid penetrant testing.

3.7 pressure vessel: A container that falls within the scope of Section VIII of the *ASME Boiler & Pressure Vessel Code* and is subject to an external or internal design pressure greater than 15 lbf/in.^{2} (103 kPa).

3.8 pressure vessel engineer: One or more persons or organizations acceptable to the owner-user who are knowledgeable and experienced in the engineering disciplines associated with evaluating mechanical and material characteristics that affect the integrity and reliability of pressure vessels. The pressure vessel engineer, by consulting with appropriate specialists, should be regarded as a composite of all entities necessary to properly address a technical requirement.

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[1]ASME International, Three Park Avenue, New York, New York 10016-5990, www.asme.org.
[2]National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Ave, Columbus, Ohio 43229, www.nationalboard.com.
[3]Tubular Exchanger Manufacturers Association, 25 North Broadway, Tarrytown, New York 10591, www.tema.org.
[4]Welding Research Council, ThreePark Avenue, 27th Floor, New York, New York 10016, www.forengineers.org.