Pressure Testing of Steel Pipelines for the Transportation of Gas, Petroleum Gas, Hazardous Liquids, Highly Volatile Liquids or Carbon Dioxide

Pipeline Segment

API RECOMMENDED PRACTICE 1110
FIFTH EDITION, JUNE 2007

SPECIAL NOTES

API publications necessarily address problems of a general nature. With respect to particular circumstances, local, state, and federal laws and regulations should be reviewed.

Neither API nor any of API's employees, subcontractors, consultants, committees, or other assignees make any warranty or representation, either express or implied, with respect to the accuracy, completeness, or usefulness of the information contained herein, or assume any liability or responsibility for any use, or the results of such use, of any information or process disclosed in this publication. Neither API nor any of API's employees, subcontractors, consultants, or other assignees represent that use of this publication would not infringe upon privately owned rights.

Users of this Recommended Practice (RP) should not rely exclusively on the information contained in this document. Sound business, scientific, engineering, and safety judgement should be used in employing the information contained herein.

API publications may be used by anyone desiring to do so. Every effort has been made by the Institute to assure the accuracy and reliability of the data contained in them; however, the Institute makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use or for the violation of any authorities having jurisdiction with which this publication may conflict.

API publications are published to facilitate the broad availability of proven, sound engineering and operating practices. These publications are not intended to obviate the need for applying sound engineering judgment regarding when and where these publications should be utilized. The formulation and publication of API publications is not intended in any way to inhibit anyone from using any other practices.

Any manufacturer marking equipment or materials in conformance with the marking requirements of an API standard is solely responsible for complying with all the applicable requirements of that standard. API does not represent, warrant, or guarantee that such products do in fact conform to the applicable API standard.

FOREWORD

Nothing contained in any API publication is to be construed as granting any right, by implication or otherwise, for the manufacture, sale, or use of any method, apparatus, or product covered by letters patent. Neither should anything contained in the publication be construed as insuring anyone against liability for infringement of letters patent.

This document was produced under API standardization procedures that ensure appropriate notification and participation in the developmental process and is designated as an API Standard. Questions concerning the interpretation of the content of this publication or comments and questions concerning the procedures under which this publication was developed should be directed in writing to the Director of Standards, American Petroleum Institute, 1220 L Street, N.W., Washington, D.C. 20005. Requests for permission to reproduce or translate all or any part of the material published herein should also be addressed to the director.

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, D.C. 20005, standards@api.org.

CONTENTS

Pressure Testing of Steel Pipelines for the Transportation of Gas, Petroleum Gas, Hazardous Liquids, Highly Volatile Liquids or Carbon Dioxide

1 Introduction

1.1 GENERAL

This Recommended Practice (RP) provides guidelines for pressure testing steel pipelines for the transportation of gas, petroleum gas, hazardous liquids, highly volatile liquids or carbon dioxide. The RP provides guidance so that:

a. Pipeline operators can select a pressure test suitable for the conditions under which the test will be conducted. This includes, but is not limited to, pipeline material characteristics, pipeline operating conditions, and various types of anomalies or other risk factors that may be present.
b. Pressure tests are planned in order to meet the overall objectives of the pressure test.
c. Site-specific procedures are developed and followed during all phases of the pressure testing process.
d. Pressure tests consider both personnel safety and environmental impacts.
e. Pressure tests are implemented by qualified personnel.
f. Pressure tests are conducted in order to meet stated acceptance criteria and pressure test objectives.
g. Pressure test records are developed, completed and retained for the useful life of the facility.

Users of this RP should be aware that further or differing requirements may be necessary for some applications. Nothing in this RP is intended to inhibit the use of engineering solutions that are not covered by the RP. This may be particularly applicable where there is innovative developing technology. Where an alternative is offered, the RP may be used, provided any and all variations from the RP are identified and documented.

1.2 GUIDING PRINCIPLES

The following RP provides a consistent means of preparing, assessing, using, and verifying pressure test results in order to help insure that the objectives of the pressure test are met. It also provides guidance for meeting the requirements of Integrity Management as stated in API Std 1160 and ASME B31.8S.

This RP is not technology specific. It accommodates present and future technologies used for pressure testing steel pipelines.

This RP is performance-based and provides guidelines for the qualification of the pressure testing processes. It does not, however, define how to meet those guidelines.

This RP provides guidelines for documenting important information during each phase of the pressure testing process.

Wherever possible, this RP utilizes existing terms and definitions from other applicable industry documents. Definitions of terms used in this RP are listed in Section 4.

The use of a pressure testing process to manage the integrity of pipelines requires an appropriate amount of interaction between the provider of the inspection service (service provider), if one is used, and the beneficiary of the service (operator). This RP provides guidelines that will enable service providers and operators to clearly define the areas of cooperation required and thus facilitate the satisfactory outcome of the pressure testing process.

Although many operators use service providers during various phases of the pressure testing process, it is important to note that the operator is ultimately responsible for:

a. Identifying specific risks (threats) to be assessed as part of the pressure testing process.
b. Choosing the proper pressure test in order to assess identified risks (threats).
c. Confirming and verifying pressure test results.

2 Scope

This RP applies to all parts of a pipeline or pipeline facility including line pipe, pump station piping, terminal piping, compressor station piping, metering station piping, delivery station piping, regulator station piping, appurtenances connected to line pipe, appurtenances connected to facility piping, fabricated assemblies, valves, tees, elbows, reducers, flanges and any other pipeline equipment or appurtenances.

This RP does not apply to pumping units, compressor units, breakout tanks, pressure vessels, control piping, sample piping, instrument piping/tubing, or any component or piping system for which other codes specify pressure testing requirements (i.e., ASME *Boiler and Pressure Vessel Code*, piping systems covered by building codes, etc.).

Although this RP contains guidelines that are based on sound engineering judgment, it is important to note that certain governmental requirements may differ from the guidelines presented in this document.

This RP does not address piping systems that are pressure tested with natural gas, nitrogen, or air.

3 References

Unless otherwise specified, the most recent editions of the following standards, codes and specifications shall, to the extent specified herein, form a part of this document.

API

Std 1160 *Managing System Integrity for Hazardous Liquid Pipelines*

ASME[1]

B31.4 *Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids*

B31.8 *Gas Transmission and Distribution Piping Systems*

B31.8S *Managing System Integrity of Gas Pipelines*

4 Terms and Definitions

4.1 anomaly: A deviation from the norm in pipe material, coatings, or welds.

4.2 appurtenance: A component that is attached to the pipeline; e.g., valve, tee, instrument connection, supports, anchors, etc.

4.3 ASME: American Society of Mechanical Engineers, also known as ASME International.

4.4 bend: A physical configuration that changes pipeline direction.

4.5 carbon dioxide: A fluid consisting of more than 90% carbon dioxide molecules compressed to a supercritical state.

4.6 certification: A written testimony of qualification.

4.7 characteristic: Any physical descriptor of a pipeline or an anomaly, such as length, depth, shape, severity, orientation, and location.

4.8 cold work: A process that affects the mechanical properties of the metal, resulting in a hardened microstructure through the formation of martensite.

4.9 component: Any physical part of the pipeline, other than line pipe, including but not limited to valves, welds, tees, flanges, fittings, taps, branch connections and outlets.

4.10 corrosion: The deterioration of a material, usually a metal, that results from a reaction with its environment.

4.11 crack: A very narrow elongated separation caused by mechanical splitting.

4.12 dead-weight tester: An instrument consisting of a finely machined piston mounted vertically in a close-fitting cylinder used for maintaining a calculable pressure; also known as a **"piston gauge."** When fitted with a means of pressure control, additional pressure ports, masses etc., the complete system is commonly known as a **"dead-weight tester."**

4.13 examination: A direct physical inspection of an anomaly by a person, which may include the use of nondestructive examination techniques.

[1]ASME International, 3 Park Avenue, New York, New York 10016, www.asme.org.