Managing Hydrotechnical Hazards for Pipelines Located Onshore or Within Coastal Zone Areas

API RECOMMENDED PRACTICE 1133
SECOND EDITION, DECEMBER 2017

AMERICAN PETROLEUM INSTITUTE

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.

API publications may be used by anyone desiring to do so. Every effort has been made by the Institute to ensure 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.

The verbal forms used to express the provisions in this document are as follows.

Shall: As used in a standard, “shall” denotes a minimum requirement in order to conform to the standard.

Should: As used in a standard, “should” denotes a recommendation or that which is advised but not required in order to conform to the standard.

May: As used in a standard, “may” denotes a course of action permissible within the limits of a standard.

Can: As used in a standard, “can” denotes a statement of possibility or capability.

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, NW, Washington, DC 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 by API, 1220 L Street, NW, Washington, DC 20005.

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

Contents

Contents

Contents

Tables

Recommended Practice for Managing Hydrotechnical Hazards for Pipelines Located Onshore or Within Coastal Zone Areas

1 Scope

This recommended practice (RP) applies to new and existing hydrocarbon pipelines that transport gas and hazardous liquids. It is intended to apply to onshore waterways and coastal zones that may be susceptible to hydrotechnical hazards. An onshore waterway is any man-made or natural channel through which water flows. Coastal zones extend offshore to a water depth of 15 ft and extend inland to include those areas of land influenced by tidal action, storm surge, back water flooding and other coastal hazards.

The RP provides guidelines and recommendations for identifying, assessing and managing risks to pipeline integrity associated with these hazards through the life-cycle of a pipeline. Except for the design and construction provisions in Section 7 of this RP which are strictly for new pipelines, this RP is for both existing and new pipelines.

2 Normative References

The following codes, standards, practices, specifications publications, and government regulations are incorporated in this RP.

API [1]

API Specification 6D, *Pipeline Valves (Gate, Plug, Ball, and Check Valves)*

API Standard 1104, *Welding of Pipelines and Related Facilities*

API Recommended Practice 1109, *Marking Liquid Petroleum Pipeline Facilities*

API Recommended Practice 1110, *Pressure Testing of Steel Pipelines for the Transportation of Gas, Petroleum Gas, Hazardous Liquids, Highly Volatile Liquids, or Carbon Dioxide*

API Recommended Practice 1117, *Movement of In-service Pipelines*

API Recommended Practice 1160, *Managing System Integrity for Hazardous Liquid Pipelines*

AWS [2]

D1.1, *Structural Welding Code*

NASTT [3]

Guidelines for a Successful Directional Crossing Bid Package, 1996

OSHA [4]

29 Code of Federal Regulations Part 1926.650 through 1926.652 (Trenching and Shoring Code Only)

---

1 American Petroleum Institute, 1220 L Street, NW, Washington, DC 20005-4070. www.api.org
2 American Welding Society, 550 NW LeJeune Road, Miami, FL 33126. www.aws.org
3 North American Society for Trenchless Technology, 1655 N Ft. Myer Drive, Suite 700, Arlington, VA 22209. www.nastt.org
4 U.S. Department of Labor, Occupational Safety and Health Administration, 200 Constitution Avenue, NW, Washington, DC 20210. www.osha.gov. Note: OSHA Regulations are posted on, and can be downloaded from the OSHA website.

3 Terms, Definitions, Acronyms, and Abbreviations

3.1 Terms and Definitions

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

3.1.1
abandonment
A pipeline permanently removed from service that has been physically separated from its source of gas or hazardous liquid and is no longer maintained.

3.1.2
anchor frazil
Ice crystals carried to or formed on the channel bottom, which covers the channel bottom with a thick mass.

3.1.3
armoring
A facing layer (protective cover) or rip-rap consisting of very large stones placed to prevent erosion or the sloughing off of soil from an embankment.

3.1.4
avulsion
Rapid abandonment of a river channel and the formation of a new river channel.

3.1.5
bed-form migration
Features such as ripples and dunes on the channel/coastal zone bed resulting from bed material being moved by flowing water that can gradually move upstream or downstream depending on local hydraulic and sediment characteristics.

3.1.6
bending stress
Internal or compressive longitudinal stress developed in response to curvature induced by an external load.

3.1.7
check dams
A low, fixed structure, constructed of timber, loose rock, rip rap, masonry, or concrete, to control water flow in an erodible channel.

3.1.8
coastal zone
Area of coastal waters and the adjacent shore lands strongly influenced by each other and includes islands, transitional and intertidal areas, salt marshes, wetlands and beaches, and extends offshore to a depth of water of 15 ft as measured from the mean low water elevation.

3.1.9
coffer dam
A temporary structure built around a site to permit construction in (relatively) dry conditions.

3.1.10
commercially navigable waterway
PHMSA Pipeline Safety has elected to use the National Waterways Network database as the basis for identifying commercially navigable waters. This database includes commercially navigable waterways in open water (i.e.

offshore or in the Great Lakes) and those that are inland (rivers, canals, harbors, etc.) where a substantial likelihood of commercial navigation exists.

3.1.11
cross vanes
Structure typically constructed from timber or loose rock designed to guide flow away from channel banks to reduce bank erosion and promote local sedimentation.

3.1.12
cuttings
A mixture of drilling mud and soil that is generated during drilling operations.

3.1.13
degradation
The general lowering of the streambed by erosive processes, such as scouring by flowing water. The removal of channel bed materials and downcutting of natural stream channels.

3.1.14
deposition
The physical process by which sediments, soil, and rock are added to a landform.

3.1.15
depth of cover (DoC)
The distance between the top of the pipeline and the surface of the ground above the pipeline. It will typically vary across the waterway due to variations in the pipeline profile and the channel bottom topography. Minimum DoC represents the least amount of ground cover above the pipeline.

3.1.16
discharge
Discharge or stream/river flow, is the volumetric rate of flowing water which is transported through a given cross-sectional area. Discharge is typically described in cubic feet per second (cfs).

3.1.17
engineered span
A pipeline designed and engineered to cross a waterway at elevations above the channel bottom. Such spans differ from those that are the result of either channel bed erosion or bank erosion.

3.1.18
erosion
The wearing away or removal of soil or other material by the action of water or other agents.

3.1.19
fatigue
The phenomenon leading to facture of a material under repeated or fluctuating stresses having a maximum value less than the tensile strength of the material.

3.1.20
fetch
The distance over which waves are generated by a wind having constant speed and direction.