Design, Construction, Operation, and Maintenance of Offshore Hydrocarbon Pipelines (Limit State Design)

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Foreword

This recommended practice (RP) sets out criteria for the design, construction, testing, operation, and maintenance of offshore steel pipelines utilized in the production, production support, or transportation of hydrocarbons, that is, the movement by pipeline of hydrocarbon liquids, gases, and mixtures of these hydrocarbons with water.

The criteria contained in this document are intended to permit the economical transportation of hydrocarbons while providing for the safety of life and property and the protection of the environment. The general adoption of these criteria should assure that offshore hydrocarbon pipelines possess the requisite structural integrity for their safe and efficient operation.

This RP includes a "limit state design" methodology. Safety margins similar to existing levels are obtained for the lower D/t ratio by changing to a limit state design based on the actual burst strength of pipe. The burst pressure formula in the document is based on theoretical considerations and confirmed by more than 250 burst tests of full-size pipe specimens that cover a wide range of pipe grade, diameter, and wall thickness.

Portions of this publication have changed from the previous editions, which have been an RP, but the changes are too numerous to use bar notations in this edition. In some cases, the changes are significant, while in other cases the changes reflect minor editorial adjustments.

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Suggested revisions are invited and should be submitted to the Standards Department, API, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC, 20001, standards@api.org.

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Introduction

Limit state design has been incorporated in this recommended practice (RP) to provide a uniform factor of safety with respect to rupture or burst failure as the primary design condition independent of the pipe diameter, wall thickness, and grade. Background on theory and practice of limit states for pressure-containing cylinders may be found in Hill [2] and in Crossland and Jones [1], as listed in the Bibliography at the end of the RP. Burst design criteria within this practice are presently defined for carbon steel line pipe. Application of the proposed design criteria to other materials requires determination by the user of the minimum burst criteria using the procedure set forth in Annex A.

Design and construction practices other than those set forth in Section 4 and Section 7 may be employed when supported by adequate technical justification, including model or proof testing of involved components or procedures as appropriate. Nothing in this RP should be considered as a fixed rule for application without regard to sound engineering judgment.

NOTE Certain governmental requirements or company specifications may differ from the criteria set forth in this RP, and this RP does not supersede or override those differing requirements or specifications.

This publication has incorporated by reference all or parts of several existing codes, standards, and RPs that have been found acceptable for application to offshore hydrocarbon pipelines.

Caution—Users shall use the most recent editions of all reference documents in this RP. For ASME B31.4 and ASME B31.8 specifically, the 2006 edition and the 2007 edition, respectively, of the documents were used as the basis for determining the requirements. However, the reference is meant to be to the corresponding part in the latest revision or edition of the publication.

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Design, Construction, Operation, and Maintenance of Offshore Hydrocarbon Pipelines (Limit State Design)

1 Scope

This recommended practice (RP) sets criteria for the design, construction, testing, operation, and maintenance of offshore steel pipelines utilized in the production, production support, or transportation of hydrocarbons; that is, the movement by pipeline of hydrocarbon liquids, gases, and mixtures of these hydrocarbons with water. This RP may also be utilized for water injection pipelines offshore.

The RP also applies to any transportation piping facilities located on a production platform downstream of separation and treatment facilities, including meter facilities, gas compression facilities, liquid pumps, associated piping, and appurtenances.

The design, construction, inspection, and testing provisions of this RP may not apply to offshore hydrocarbon pipelines designed or installed before this latest revision of the RP was issued. The operation and maintenance provisions of this RP are suitable for application to existing facilities.

For a graphic representation of the scope of this RP, see Figure 1.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API Recommended Practice 2A-WSD, *Planning, Designing, and Constructing Fixed Offshore Platforms—Working Stress Design*

API Standard 2RD, *Dynamic Risers for Floating Production Systems*

API Specification 5L, *Specification for Line Pipe*

API Recommended Practice 5L1, *Recommended Practice for Railroad Transportation of Line Pipe*

API Specification 6A, *Specification for Wellhead and Christmas Tree Equipment*

API Specification 6D, *Specification for Pipeline and Piping Valves*

API Recommended Practice 14C, *Recommended Practice for Analysis, Design, Installation, and Testing of Basic Surface Safety Systems for Offshore Production Platforms*

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

ASME B31G [1], *Manual for Determining the Remaining Strength of Corroded Pipelines*

ASME B31.4, *Pipeline Transportation Systems for Liquids and Slurries*

ASME B31.8, *Gas Transmission and Distribution Piping Systems*

ASME *Boiler and Pressure Vessel Code* (*BPVC*), *Section IX: Welding, Brazing, and Fusing Qualifications*

[1] ASME International, 2 Park Avenue, New York, New York 10016-5990, www.asme.org.

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