



AMERICAN PETROLEUM INSTITUTE

API Recommended Practice 1111

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

FIFTH EDITION | SEPTEMBER 2015 | 67 PAGES | \$140.00 | PRODUCT NO. D11115

This recommended practice (RP) sets criteria for the design, construction, testing, operation, and maintenance of offshore steel pipelines used 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 used 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 ordering information:

Online: www.api.org/pubs

Phone: 1-800-854-7179
(Toll-free in the U.S. and Canada)

(+1) 303-397-7056
(Local and International)

Fax: (+1) 303-397-2740

API members receive a 30% discount where applicable.

Contents

Page

1	Scope	1
2	Normative References	1
3	Terms, Definitions, Acronyms, Abbreviations, and Symbol	3
3.1	Terms and Definitions	3
3.2	Acronyms, Abbreviations, and Symbols	5
4	Design	7
4.1	Design Conditions	7
4.2	Design Criteria	10
4.3	Pressure Design of Components	11
4.4	Marine Design	17
4.5	Fatigue Analysis	19
4.6	Load Limits	20
4.7	Valves, Supporting Elements, and Piping	21
4.8	Route Selection	21
4.9	Flow Assurance	22
4.10	Thermal Expansion Design	22
5	Materials and Dimensions	23
5.1	Materials	23
5.2	Dimensions	24
6	Safety Systems	24
6.1	General	24
6.2	Liquid and Gas Transportation Systems on Nonproduction Platforms	24
6.3	Liquid and Gas Transportation Systems on Production Platforms	24
6.4	Breakaway Connectors	24
7	Construction and Welding	25
7.1	Construction	25
7.2	Welding	26
7.3	Other Components and Procedures	28
8	Inspection and Testing	29
8.1	General	29
8.2	Testing	30
9	Operation and Maintenance	33
9.1	System Guidelines	33
9.2	Pipeline Operations	33
9.3	Emergency Plan	37
9.4	Records	37
9.5	Qualification of the Pipeline System for Higher Operating Pressure	38
9.6	Change in Pipeline Use	38
9.7	Pipeline Abandonment	38
10	Corrosion Control	38
10.1	General	38
10.2	External Coatings	39

Contents

	Page
10.3 Cathodic Protection	39
10.4 Internal Corrosion Control	40
10.5 Maintenance of Cathodic Protection Systems.....	40
10.6 Records.....	40
Annex A (normative) Procedure for Determining Burst Design Criteria for Other Materials	41
Annex B (normative) Qualification of Increased Minimum Burst Pressure	45
Annex C (informative) Example Calculations for Internal Pressure (Burst) Design and Wall Thickness	47
Annex D (informative) External Pressure Design Example.....	62
Bibliography	66
 Figures	
1 Scope of API 1111	2
2 Pressure Level Relations	10
A.1 Ductile Burst Sample	43
A.2 Brittle Burst Sample	43
C.1 Example Subsea Flowlines and Risers.....	52
 Tables	
1 Minimum Radius of Field Cold Bends.....	20
C.1 Pipe Data.....	47
C.2 PIP, Gas/Oil Production Flowline and Riser	53
C.3 Single-pipe, Gas/Oil Production Flowline and Riser.....	54
C.4 PIP, Gas/Oil Production Flowline and Riser Limiting Riser to Within a Horizontal Distance of 300 ft from the Surface Facility	55
C.5 Single-pipe, Gas/Oil Production Flowline and Riser Limiting Riser to Within a Horizontal Distance of 300 ft from the Surface Facility	56
C.6 PIP, Gas/Oil Production Flowline and Riser Increased Burst Pressure Due to Improved Mechanical Properties and Dimensions Control	57
C.7 Single-pipe, Gas/Oil Production Flowline and Riser Increased Burst Pressure Due to Improved Mechanical Properties and Dimensions Control.....	58
C.8 PIP, Gas/Oil Production Flowline and Riser Limiting Riser to Within a Horizontal Distance of 300 ft from the Surface Facility Increased Burst Pressure Due to Improved Mechanical Properties and Dimensions Control	59
C.9 Single-pipe, Gas/Oil Production Flowline and Riser Limiting Riser to Within a Horizontal Distance of 300 ft from the Surface Facility Increased Burst Pressure Due to Improved Mechanical Properties and Dimensions Control.....	60
C.10 Comparison of Results	61
D.1 Net External Pressure Loading	63
D.2 Collapse Pressure	63
D.3 External Pressure Collapse Resistance	63
D.4 Buckling Limit State Bending Strains	64
D.5 Combined Bending and External Buckle Resistance	65