

Specification for Unbonded Flexible Pipe

API SPECIFICATION 17J
FOURTH EDITION, MAY 2014

EFFECTIVE DATE: NOVEMBER 2014

ERRATA 1, SEPTEMBER 2016
ERRATA 2, MAY 2017
ADDENDUM 1, OCTOBER 2017

REAFFIRMED, MARCH 2021



American
Petroleum
Institute

Date of Issue: October 2017

Affected Publication: API Specification 17J, *Specification for Unbonded Flexible Pipe*, Fourth Edition, May 2014

Addendum 1

Page 2, Section 2, the following shall be added:

ASTM D1141, *Standard Practice of the Preparation of Substitute Ocean Water*

Page 53, Section 6.2.4.6, change:

The tensile armors shall be subject to testing to confirm that the potential hydrogen evolution resulting from cathodic charging does not result in hydrogen embrittlement. The testing shall be conducted on degreased wire samples immersed in deaerated seawater (minimum 3 % NaCl) with the maximum negative cathodic potential applied. The wire shall be stressed to at least the maximum utilization level expected in service. The cathodic charging shall be applied for a minimum duration of 150 h. Post-test examination shall be conducted to confirm that no blistering or cracking of the wire sample has occurred.

to:

The tensile armor wires shall be tested to confirm that the potential hydrogen evolution resulting from cathodic charging does not result in hydrogen embrittlement. The testing shall be conducted on degreased wire samples immersed in aerated synthetic seawater that conforms to ASTM D1141, with a maximum negative cathodic potential applied per the manufacturer's specification.

NOTE The default value of the maximum negative potential is -1100 mV measured against the Ag/AgCl reference electrode.

The wire shall be stressed to its maximum utilization level expected in service. The cathodic charging shall be applied for a minimum duration of 150 h. Post-test examination shall be conducted, and the acceptance criterion shall be that no blistering or cracking of the wire sample has occurred.

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 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.

Users of this Specification should not rely exclusively on the information contained in this document. Sound business, scientific, engineering, and safety judgment should be used in employing the information contained herein.

All rights reserved. No part of this work may be reproduced, translated, stored in a retrieval system, or transmitted by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission from the publisher. Contact the Publisher, API Publishing Services, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001.

Copyright © 2014 American Petroleum Institute

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.

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

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

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, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001. 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, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001.

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.

Contents

Page

1	Scope	1
2	Normative References	1
3	Terms, Definitions, Acronyms, Abbreviations, and Symbols	4
3.1	Terms and Definitions	4
3.2	Acronyms, Abbreviations, and Symbols	12
4	Functional Requirements	14
4.1	General	14
4.2	Overall Requirements	14
4.3	General Design Parameters	14
4.4	Internal Fluid Parameters	15
4.5	External Environment	18
4.6	System Requirements	19
5	Design Requirements	22
5.1	Loads and Load Effects	22
5.2	Pipe Design Methodology	29
5.3	Pipe Structure Design	30
5.4	System Design Requirements	38
6	Materials	42
6.1	Material Requirements	42
6.2	Testing Requirements	46
6.3	Quality Assurance Requirements	54
7	Manufacturing Requirements	57
7.1	Quality Assurance Requirements	57
7.2	Carcass	58
7.3	Polymer Extrusions	58
7.4	Pressure and Tensile Armor Layers	60
7.5	Antiwear, Insulation, and Antibuckling Tape Layers	61
7.6	End Fitting	61
7.7	Processes Requiring Validation	63
7.8	Manufacturing Tolerances	65
7.9	Repairs	65
8	Documentation	66
8.1	General	66
8.2	Design Premise	66
8.3	Design Load Report	67
8.4	Design Report	67
8.5	Pipe Datasheet	69
8.6	Manufacturing Quality Plan	69
8.7	Fabrication Specification	69
8.8	As-built Documentation	70
8.9	Operation Manual	71
9	Factory Acceptance Tests (FATs)	72
9.1	General	72
9.2	Gauge Test	72

9.3	Hydrostatic Pressure Test	73
9.4	Electrical Continuity and Electrical Isolation Tests	74
9.5	Gas-venting System Test	74
9.6	Sealing Test	75
10	Marking and Packaging	76
10.1	Marking	76
10.2	Packaging	76
	Annex A (informative) API Monogram Program—Use of the API Monogram by Licensees	77
	Annex B (informative) Purchasing Guidelines	81
	Annex C (informative) Flexible Pipe Datasheet	88
	Bibliography	89

Tables

1	Internal Fluid Parameters	15
2	Internal Pressure Definitions	17
3	Temperature Definitions	18
4	External Environment Parameters	19
5	Flowline and Riser Parameters	24
6	Load Combinations of Load Classes, Load Conditions	25
7	Typical Load Classes	26
8	Flexible Pipe Layer Design Criteria	27
9	Minimum Bend Radius Design Criteria	31
10	End-fitting Permissible Utilization Factors	36
11	System-related Pipe Design Requirements	39
12	Property Requirements for Polymer Materials	44
13	Property Requirements for Metallic Wire and Strip Materials and Weldments	45
14	Property Requirements for Antibuckling Tapes	47
15	Test Procedures for Extruded Polymer (Including Antiwear Layers and Insulation) and Antibuckling Layer Materials	49
16	Test Procedures for Metallic Materials (Carcass Strip, Pressure Armor, and Tensile Armor Wires) and Weldments	52
17	Minimum Raw Material Quality Control Test Requirements	55
18	Requirements of Material Specifications	56
19	Documentation Requirements for the Design Premise	67
20	Factory Acceptance Test	72
B.1	Flexible Pipe Purchasing Guidelines	81
C.1	Flexible Pipe Datasheet Minimum Requirements	88

Figures

1	Internal Pressure Definitions	16
---	-------------------------------	----

Specification for Unbonded Flexible Pipe

1 Scope

API 17J defines the technical requirements for safe, dimensionally and functionally interchangeable flexible pipes that are designed and manufactured to uniform standards and criteria. Minimum requirements are specified for the design, material selection, manufacture, testing, marking, and packaging of flexible pipes, with reference to existing codes and standards where applicable. See API 17B for guidelines on the use of flexible pipes.

API 17J applies to unbonded flexible pipe assemblies, consisting of segments of flexible pipe body with end fittings attached to both ends. API 17J does not cover flexible pipes of bonded structure. API 17J does not apply to flexible pipe ancillary components. Guidelines on flexible pipe ancillary components are given in API 17L1, API 17L2, and other API documents.

API 17J does not apply to flexible pipes that include nonmetallic tensile and pressure armor wires.

The applications addressed by API 17J are sweet and sour service production, including export and injection applications. Production products include oil, gas, water, and injection chemicals. API 17J applies to both static and dynamic flexible pipes used as flowlines, risers, and jumpers. API 17J does not apply to flexible pipes for use in choke and kill line applications. Annex H of API 17B provides recommendations for the application of fiber reinforced polymer materials for pressure armor and tensile armor in unbonded flexible pipe.

NOTE 1 See API 16C for choke and kill line applications.

NOTE 2 API 17K provides guidelines for bonded flexible pipe.

If product is supplied bearing the API Monogram and manufactured at a facility licensed by API, the requirements of Annex A apply.

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

API Specification 17D, *Specification for Subsea Wellhead and Christmas Tree Equipment*

API Recommended Practice 17L2, *Recommended Practice for Flexible Pipe Ancillary Equipment*

API Technical Report 17TR1, *Evaluation Standard for Internal Pressure Sheath Polymers for High Temperature Flexible Pipes*

API Technical Report 17TR2, *The Ageing of PA-11 in Flexible Pipes*

ASME Boiler and Pressure Vessel Code ¹, *Section IX: Welding and Brazing Qualifications*

ASTM A29 ², *Standard Specification for Steel Bars, Carbon and Alloy, Hot-Wrought, General Requirements for*

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

² ASTM International, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428, www.astm.org.