

Specification for Flexible Pipe Ancillary Equipment

API SPECIFICATION 17L1
FIRST EDITION, MARCH 2013

ERRATA 1, JANUARY 2015
ERRATA 2, NOVEMBER 2015

REAFFIRMED, AUGUST 2020



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 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.

Classified areas may vary depending on the location, conditions, equipment, and substances involved in any given situation. Users of this Specification should consult with the appropriate authorities having jurisdiction.

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.

Copyright 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.

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 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001, standards@api.org.

This standard shall become effective on the date printed on the cover but may be used voluntarily from the date of distribution. Standards referenced herein may be replaced by newer international or national standards that can be shown to meet or exceed the requirements of the referenced standard.

This standard is under the jurisdiction of the API Subcommittee on Subsea Production Systems. API Subcommittee 17 documents consists of the following.

- RP 17A, *Design and Operation of Subsea Production Systems—General Requirements and Recommendations*
- RP 17B, *Recommended Practice for Flexible Pipe*
- RP 17C, *Recommended Practice on Through Flowline Systems*
- Spec 17D, *Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment*
- Spec 17E, *Specification for Subsea Umbilicals*
- Spec 17F, *Specification for Subsea Production Control Systems*
- RP 17G, *Recommended Practice for Completion/Workover Risers*
- RP 17H, *Remotely Operated Vehicle (ROV) Interfaces on Subsea Production Systems*
- Spec 17J, *Specification for Unbonded Flexible Pipe*
- Spec 17K, *Specification for Bonded Flexible Pipe*
- Spec 17L1, *Specification for Flexible Pipe Ancillary Equipment*
- RP 17L2, *Recommended Practice for Flexible Pipe Ancillary Equipment*
- RP 17M, *Recommended Practice on Remotely Operated Tool (ROT) Intervention Systems*
- RP 17N, *Recommended Practice for Subsea Production System Reliability and Technical Risk Management*
- RP 17O, *Recommended Practice for Subsea High Integrity Pressure Protection Systems (HIPPS)*
- RP 17P, *Subsea Structures and Manifolds (in press)*
- RP 17Q, *Subsea Equipment Qualification—Standardized Process for Documentation*

Contents

page

1	Scope	1
2	Normative References	2
3	Terms, Definitions, Abbreviations and Symbols	5
3.1	Terms and Definitions	5
3.2	Symbols and Abbreviated Terms	11
4	General Requirements	7
4.1	Description	17
4.2	Functional Requirements	18
4.3	Design Requirements	21
4.4	Material Requirements	29
4.5	Manufacturing Requirements	35
4.6	Documentation	39
4.7	Factory Acceptance Tests	42
4.8	Marking and Packaging	43
5	Bend Stiffeners	43
5.1	Applicability	43
5.2	Functional Requirements	44
5.3	Design Requirements	46
5.4	Material Requirements	51
5.5	Manufacturing Requirements	53
5.6	Documentation	54
5.7	Factory Acceptance Tests	56
5.8	Marking	57
6	Bend Restrictors	57
6.1	Applicability	57
6.2	Functional Requirements	58
6.3	Design Requirements	61
6.4	Material Requirements	65
6.5	Manufacturing Requirements	65
6.6	Documentation	67
6.7	Factory Acceptance Tests	69
6.8	Marking and Packaging	70
7	Bellmouths	71
7.1	Applicability	71
7.2	Functional Requirements	71
7.3	Design Requirements	73
7.4	Material Requirements	75
7.5	Manufacturing Requirements	76
7.6	Documentation	77
7.7	Factory Acceptance Tests	78
7.8	Marking	79
8	Bucancy and Ballast Modules	79
8.1	Applicability	79
8.2	Functional Requirements	80
8.3	Design Requirements—Loads	82
8.4	Design Methodology	82
8.5	Material Requirements	86
8.6	Manufacturing Requirements	88
8.7	Documentation	91

8.8	Factory Acceptance Tests	93
8.9	Marking and Packaging	95
9	Subsea Buoys	96
9.1	Applicability	96
9.2	Functional Requirements	96
9.3	Design Requirements	100
9.4	Material Requirements	106
9.5	Manufacturing Requirements	107
9.6	Documentation	107
9.7	Factory Acceptance Tests	111
9.8	Marking	113
10	Tethers	114
10.1	Applicability	114
10.2	Functional Requirements	114
10.3	Design Requirements	116
10.4	Material Requirements	119
10.5	Manufacturing Requirements	120
10.6	Documentation—Design Report	120
10.7	Factory Acceptance Tests	121
10.8	Marking and Packaging	121
11	Riser and Tether Bases	122
11.1	Applicability	122
11.2	Functional Requirements—General	122
11.3	Functional Requirements—Riser Bases	123
11.4	Functional Requirements—Tether Bases	125
11.5	Design Requirements	125
11.6	Material Requirements	129
11.7	Manufacturing Requirements	129
11.8	Documentation—Design Report	129
11.9	Factory Acceptance Tests	131
11.10	Marking	133
12	General Clamping Device Requirements	133
12.1	Applicability	133
12.2	Functional Requirements	134
12.3	Design Requirements	135
12.4	Material Requirements—Polymer Inner-liner Materials	136
12.5	Documentation—Clamping Design Report	137
13	Subsea Buoy Clamps	137
13.1	Applicability	137
13.2	Functional Requirements	138
13.3	Design Requirements	139
13.4	Material Requirements	140
13.5	Manufacturing Requirements—Process Control	141
13.6	Documentation	141
13.7	Factory Acceptance Tests	142
13.8	Marking	143
14	Tether Clamps	143
14.1	Applicability	143
14.2	Functional Requirements	144
14.3	Design Requirements	146
14.4	Material Requirements	147
14.5	Manufacturing Requirements—Process Control	148
14.6	Documentation	149

14.7	Factory Acceptance Tests	150
14.8	Marking	151
15	Piggy-back Systems	152
15.1	Applicability	152
15.2	Functional Requirements	152
15.3	Design Requirements	155
15.4	Material Requirements.....	155
15.5	Manufacturing Requirements	155
15.6	Documentation	160
15.7	Factory Acceptance Tests	161
15.8	Marking	163
16	Repair Clamps	163
16.1	Applicability	163
16.2	Functional Requirements	163
16.3	Design Requirements	165
16.4	Material Requirements.....	167
16.5	Manufacturing Requirements	167
16.6	Documentation	167
16.7	Factory Acceptance Tests	169
16.8	Marking	170
17	I/J-tube Seals	170
17.1	Applicability	170
17.2	Functional Requirements	171
17.3	Design Requirements	173
17.4	Material Requirements.....	175
17.5	Manufacturing Requirements	176
17.6	Documentation	177
17.7	Factory Acceptance Tests	178
17.8	Marking and Packaging	180
18	Pull-in Heads	181
18.1	Applicability	181
18.2	Functional Requirements	181
18.3	Design Requirements	183
18.4	Manufacturing Requirements — Tolerances.....	184
18.5	Documentation Requirements	184
18.6	Factory Acceptance Tests	186
18.7	Marking and Packaging	187
19	Chinese Fingers/Cable Grips	187
19.1	Applicability	187
19.2	Functional Requirements	188
19.3	Design Requirements	189
19.4	Material Requirements.....	189
19.5	Manufacturing Requirements	189
19.6	Documentation Requirements	189
19.7	Factory Acceptance Tests	190
19.8	Marking	191
20	Connectors	191
20.1	Applicability	191
20.2	Functional Requirements	191
20.3	Design Requirements	193
20.4	Material Requirements.....	195
20.5	Manufacturing Requirements	196

20.6	Documentation	196
20.7	Factory Acceptance Tests	197
20.8	Marking and Packaging	197
21	Load-transferring Devices	198
21.1	Applicability	198
21.2	Functional Requirements	198
21.3	Design Requirements	200
21.4	Material Requirements	200
21.5	Manufacturing Requirements	200
21.6	Documentation	204
21.7	Factory Acceptance Tests	206
21.8	Marking and Packaging	209
22	Mechanical Protection	209
22.1	Applicability	209
22.2	Functional Requirements—General	210
22.3	Functional Requirements—Abrasion and Impact Protection	210
22.4	Functional Requirements—Blanket Protection	212
22.5	Design Requirements—General	213
22.6	Design Requirements—General	213
22.7	Material Requirements	215
22.8	Manufacturing Requirements—Process Control	215
22.9	Documentation	216
22.10	Factory Acceptance Tests	218
22.11	Marking and Packaging	219
23	Fire Protection	220
23.1	Applicability	220
23.2	Functional Requirements	220
23.3	Design Requirements	222
23.4	Material Requirements	225
23.5	Manufacturing Requirements	227
23.6	Documentation	227
23.7	Factory Acceptance Tests	228
23.8	Marking	229
Annex A (informative)	Purchasing Guidelines for Bend Stiffeners	230
Annex B (informative)	Purchasing Guidelines for Bend Restrictors	237
Annex C (informative)	Purchasing Guidelines for Bellmouths	242
Annex D (informative)	Purchasing Guidelines for Buoyancy and Ballast Modules	247
Annex E (informative)	Purchasing Guidelines for Subsea Buoys	259
Annex F (informative)	Purchasing Guidelines for Tethers	266
Annex G (informative)	Purchasing Guidelines for Riser and Tether Bases	270
Annex H (informative)	Purchasing Guidelines for Subsea Buoy Clamps	280
Annex I (informative)	Purchasing Guidelines for Tether Clamps	285
Annex J (informative)	Purchasing Guidelines for Piggy-back Systems	291
Annex K (informative)	Purchasing Guidelines for Repair Clamps	299
Annex L (informative)	Purchasing Guidelines for I/J-tube Seals	304
Annex M (informative)	Purchasing Guidelines for Pull-in Heads	310
Annex N (informative)	Purchasing Guidelines for Chinese Fingers/Cable Grips	312

Annex O (informative) Purchasing Guidelines for Connectors	314
Annex P (informative) Purchasing Guidelines for Load-transfer Devices	319
Annex Q (informative) Purchasing Guidelines for Mechanical Protection	325
Annex R (informative) Purchasing Guidelines for Fire Protection	332
Bibliography	337

Currently in preview, click buy full version

Introduction

This specification is the result of a Joint Industry Project to develop a worldwide industry standard for the design, material selection, manufacture, documentation, testing, marking and packaging of flexible pipe ancillary equipment. The objective of this specification is to provide an integrated approach, together with API 17B, API 17J, API 17K and API 17L2, to the design of flexible pipe systems. Therefore it is intended that this document be used in close conjunction with these documents.

Within this document, “shall” is used to state that a provision is mandatory; “should” is used to state that a provision is not mandatory, but is recommended as good practice; “may” is used to state that a provision is optional.

Systeme Internationale (SI) units are identified first when cited in the document. United States Customary (USC) units may be given in brackets after the SI units.

Specification for Flexible Pipe Ancillary Equipment

1 Scope

This specification defines the technical requirements for safe, dimensionally and functionally interchangeable flexible pipe ancillary equipment that is designed and manufactured to uniform standards and criteria.

Minimum requirements are specified for the design, material selection, manufacture, testing, documentation, marking and packaging of flexible pipe ancillary equipment, with reference to existing codes and standards where applicable. See API 17L2 for guidelines on the use of ancillary equipment.

The applicability relating to a specific item of ancillary equipment is stated at the beginning of the particular section for the ancillary equipment in question.

This specification applies to the following flexible pipe ancillary equipment:

- bend stiffeners;
- bend restrictors;
- bellmouths;
- buoyancy modules and ballast modules;
- subsea buoys;
- tethers for subsea buoys and tether clamps;
- riser and tether bases;
- clamping devices;
- piggy-back clamps;
- repair clamps;
- I/J-tube seals;
- pull-in heads/installation aids;
- connectors;
- load-transfer devices;
- mechanical protection;
- fire protection.

This specification may be used for bonded flexible pipe ancillary equipment, though any requirements specific to these applications are not addressed.