

Casing and Tubing

API SPECIFICATION 5CT
TENTH EDITION, JUNE 2018

ERRATA 1, DECEMBER 2018
ERRATA 2, MAY 2019
ERRATA 3, JUNE 2020

API MONOGRAM PROGRAM EFFECTIVE DATE: JULY 1, 2019

ADDENDUM 1, JANUARY 2021
(API MONOGRAM PROGRAM EFFECTIVE DATE: AUGUST 1, 2021)

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.

Copyright © 2018 American Petroleum Institute. 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.

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 specification are as follows:

- the term “shall” denotes a minimum requirement in order to conform to the standard;
- the term “should” denotes a recommendation or that which is advised but not required in order to conform to the standard;
- the term “may” is used to express permission or a provision that is optional;
- the term “can” is used to express possibility or capability.

Informative elements—As used in a standard, “informative” denotes elements that identify the document, introduce its content, and explain its background, development, and its relationship with other documents or provide additional information intended to assist the understanding or use of the document.

Normative elements—As used in a standard, “normative” denotes elements that describe the scope of the document and that set out provisions that are required to implement the standard.

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, if necessary, reaffirmed, or withdrawn at least every 5 years. A one-time extension of up to 2 years may be added to the 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
1.1 Coverage	1
1.2 Applicability-Connections	1
1.3 Applicability-Grades	1
1.4 Supplementary Requirements	2
1.5 Application of the API Monogram	2
2 Normative References	2
3 Terms, Definitions, Symbols, and Abbreviations	4
3.1 Terms and Definitions	4
3.2 Symbols	8
3.3 Abbreviations	9
4 Conformance	9
4.1 References to Annexes	9
4.2 Extended Scope	10
4.3 Dual Referencing	10
4.4 Units of Measurement	10
5 Information to be Supplied by the Purchaser	11
5.1 Grades C90, T95, and C110	11
5.2 Casing	11
5.3 Tubing	14
5.4 Coupling Stock, Coupling Material, and Accessory Material	16
6 Process of Manufacture	18
6.1 General	18
6.2 Heat Treatment	18
6.3 Straightening	19
6.4 Traceability	20
6.5 Processes Requiring Validation	20
7 Material Requirements	21
7.1 Chemical Composition	21
7.2 Tensile Properties	21
7.3 Charpy V-notch Test-General Requirements	22
7.4 Charpy V-notch-Absorbed Energy Requirements for Coupling Stock, Coupling Material, Coupling Blanks, and Couplings	23
7.5 Charpy V-notch-Absorbed Energy Requirements for Pipe	24
7.6 Charpy V-notch-Absorbed Energy Requirements for Accessory Material	26
7.7 Maximum Hardness	27
7.8 Hardness Variation-Grades C90, T95, C110, and Q125	28
7.9 Process Control-Grades C90, T95, C110, and Q125	28
7.10 Hardenability-Minimum Percentage Martensite for Quenched and Tempered Products	28
7.11 Grain Size-Grades C90, T95, and C110	29
7.12 Surface Condition-Grades L80 9Cr and L80 13Cr	29
7.13 Flattening-Electric-welded Pipe	29
7.14 Sulfide Stress Cracking Test-Grades C90, T95, and C110	29
8 Dimensions, Masses, Tolerances, Product Ends, and Defects	32
8.1 Labels and Sizes	32
8.2 Dimensions and Masses	32

Contents

	Page
8.3 Diameter	33
8.4 Wall Thickness	33
8.5 Mass	33
8.6 Length	34
8.7 Casing Joints	34
8.8 Height and Trim of Electric-weld Flash	34
8.9 Straightness	35
8.10 Drift Requirements	36
8.11 Tolerances on Dimensions and Masses	36
8.12 Product Ends	37
8.13 Defects	38
8.14 Coupling Make-up and Thread Protection	39
9 Couplings	40
9.1 General Requirements	40
9.2 Alternative Grades or Heat Treatments	40
9.3 Mechanical Properties	41
9.4 Dimensions and Tolerances	41
9.5 Regular Couplings	41
9.6 Special Clearance Couplings-All Grades Except Q125	41
9.7 Combination Couplings	42
9.8 Seal-ring Couplings	42
9.9 Special-bevel Tubing Regular Couplings-All Grades Except C110 and Q125	42
9.10 Threading	42
9.11 Surface Inspection	42
9.12 Measurement of Imperfections	43
9.13 Repair and Removal of Imperfections and Defects	43
9.14 Thread Surface Treatment-Grade Q125	43
9.15 Couplings and Coupling Blank Protection-Grades C90, T95, C110, and Q125	44
10 Inspection and Testing	44
10.1 Test Equipment	44
10.2 Lot Definition for Testing of Mechanical Properties	44
10.3 Testing of Chemical Composition	45
10.4 Tensile Tests	46
10.5 Flattening Test	49
10.6 Hardness Tests	50
10.7 Impact Test	56
10.8 Grain Size Determination-Grades C90, T95, and C110	58
10.9 Harderability-Grades C90, T95, and C110	58
10.10 Sulfide Stress-cracking Test-Grades C90, T95, and C110	58
10.11 Metallographic Evaluation-EW Grades P110 and Q125	59
10.12 Hydrostatic Tests	59
10.13 Dimensional Testing	61
10.14 Visual Inspection	64
10.15 Non-destructive Examination (NDE)	65
11 Marking	74
11.1 General	74
11.2 Stamp Marking Requirements	75

Contents

	Page
11.3 Stencil Marking Requirements	76
11.4 Color Identification	77
11.5 Thread and End-finish Marking	77
11.6 Pipe-threader Marking Requirements	78
12 Coating and Protection	78
12.1 Coatings	78
12.2 Thread Protectors	79
13 Documents	79
13.1 Electronic Media	79
13.2 Certification Requirements	80
13.3 Certification Content	80
13.4 Retention of Records	81
14 Minimum Facility Requirements for Various Categories of Manufacturer	81
14.1 Pipe Mill	81
14.2 Processor	81
14.3 Pipe Threader	82
14.4 Coupling, Pup joint, or Accessory Manufacturer	82
Annex A (informative) API Monogram Program Use of the API Monogram by Licensees	84
Annex B (normative) Purchaser Inspection	88
Annex C (normative) Tables in SI Units	89
Annex D (normative) Figures in SI (USC) Units	153
Annex E (normative) Tables in USC Units	182
Annex F (informative) Additional Information for API Monogram Licensees	247
Annex G (informative) Procedures Used to Convert from USC to SI Units	248
Annex H (normative) Product Specification Levels	261
Annex I (normative) Requirements for Thread Protector Design Validation	269
Annex J (informative) Summary of Product Specification Level (PSL) Requirements	273
Annex K (normative) Supplementary Requirements	278
Bibliography	292
Tables	
1 Purchaser Supplied Information (Casing)	11
2 Purchaser Supplied Agreement Optional Requirements (Casing)	12
3 Purchaser/Manufacturer Agreement (Casing)	13
4 Purchaser Supplied Information (Tubing)	14
5 Purchaser Supplied Agreement Optional Requirements (Tubing)	15
6 Purchaser/Manufacturer Agreement (Tubing)	16
7 Purchaser Supplied Information (Coupling Stock and Material and Accessory Material)	17
8 Purchaser Supplied Agreement Optional Requirements (Coupling Stock and Material, and Accessory Material)	17

Contents

	Page
9 Full-size Test Specimen Minimum Absorbed Energy Requirements (Threads for Grades N80 [All Types], R95, L80 [All Types], C90, T95, P110, and Q125)	21
10 Full-size Test Specimen Minimum Absorbed Energy Requirements (Pipe for Grades N80 [All Types], R95, L80, C90, T95, and P110)	25
11 Full-size Test Specimen Minimum Absorbed Energy Requirements (Pipe for Grades C110 and Q125)	26
12 Electric-weld Flash Height and Trim (All Grades Except P110 and Q125)	35
13 Dimension Tolerances (Pipe OD)	36
14 Dimension Tolerances (Upset Integral Tubing)	36
15 Dimension Tolerances (External Upset Tubing)	37
16 Standard Mass Tolerances	37
17 Stamp Marking	75
C.1 API Casing List (sizes, masses, wall thickness, grade, and applicable end finish)	89
C.2 API Tubing List (sizes, masses, wall thickness, grade, and applicable end finish)	92
C.3 Process of Manufacture and Heat Treatment	93
C.4 Chemical Composition, Mass Fraction (%)	94
C.5 Tensile and Hardness Requirements	95
C.6 Elongation Table	96
C.7 Critical Thickness for Couplings with API Threads	98
C.8 Acceptable Size Impact Specimens and Absorbed Energy Reduction Factor	99
C.9 Hierarchy of Test Specimen Orientation and Size	99
C.10 Charpy Impact Test Specimen Requirements for Couplings, Coupling Stock, Coupling Material, Coupling Blanks, and Accessory Material for Grades J55 and K55	100
C.11 Charpy Impact Test Specimen Requirements for Couplings, Coupling Stock, Coupling Material, Coupling Blanks, and Accessory Material for Grade L80 (All Types)	101
C.12 Charpy Impact Test Specimen Requirements for Couplings, Coupling Stock, Coupling Material, Coupling Blanks, and Accessory Material for Grade C90	102
C.13 Charpy Impact Test Specimen Requirements for Couplings, Coupling Stock, Coupling Material, Coupling Blanks, and Accessory Material for Grades N80 (All Types), R95, and T95	103
C.14 Charpy Impact Test Specimen Requirements for Couplings, Coupling Stock, Coupling Material, Coupling Blanks, and Accessory Material for Grade P110	104
C.15 Charpy Impact Test Specimen Requirements for Couplings, Coupling Stock, Coupling Material, Coupling Blanks, and Accessory Material for Grade Q125	105
C.16 Transverse Charpy Absorbed Energy Requirements for Couplings, Coupling Stock, Coupling Material, Coupling Blanks, and Accessory Material	106
C.17 Longitudinal Charpy Absorbed Energy Requirements for Couplings, Coupling Stock, Coupling Material, Coupling Blanks, and Accessory Material	107
C.18 Transverse Charpy Absorbed Energy Requirements for Pipe	108
C.19 Longitudinal Charpy Absorbed Energy Requirements for Pipe	110
C.20 Transverse Impact Specimen Size Required for Quenched and Tempered Product	110
C.21 Longitudinal Impact Specimen Size Required for Quenched and Tempered Product	111
C.22 Distance between Plates for Electric-weld Flattening Tests	112
C.23 Dimensions and Masses for Standard Casing and for Casing Threaded with API Round Thread and Buttress Thread	113
C.24 Dimensions and Masses for Standard Tubing and for Tubing Threaded with API Non-upset, External Upset, and Integral Tubing Connections	118
C.25 External Upset Tubing Dimensions for API Connections for Grades H40, J55, L80 (All Types), R95, N80 (All Types), C90, T95, and P110	121

Contents

Page

C.26 Integral Tubing Connection Dimensions for API Connections for Grades H40, J55, L80 (All Types), R95, N80 (All Types), C90, and T95	120
C.27 Range Lengths	121
C.28 Standard Drift Size	123
C.29 Alternative Drift Size	124
C.30 Maximum Permissible Depth of Linear Imperfections	124
C.31 Upset Products-Maximum Permissible Depth of Imperfections	125
C.32 API Round-thread Casing Coupling-Dimensions, Tolerances, and Masses	126
C.33 API Buttress Thread Casing Coupling-Dimensions, Tolerances, and Masses	127
C.34 API Non-upset Tubing Coupling-Dimensions, Tolerances, and Masses	128
C.35 API External-upset Tubing Coupling-Dimensions, Tolerances, and Masses	129
C.36 Permissible Depth of External Imperfections on Coupling	129
C.37 Frequency of Tensile Tests-Casing and Tubing	130
C.38 Frequency of Tensile Tests-Coupling Stock, Coupling Material, and Coupling Blanks	131
C.39 Frequency of Tensile Testing-Pup Joints and Accessory Material	132
C.40 Frequency of Hardness Testing	133
C.41 Frequency of Flattening Tests	135
C.42 Summary of NDE Methods for Seamless Pipe, Coupling Stock, Body of Welded Pipe, and Accessory Material (in accordance with 10.15.11)	136
C.43 Acceptance (Inspection) Levels	137
C.44 Artificial Reference Indicators	138
C.45 Size of Stamp Markings	138
C.46 Grade Color Codes	139
C.47 Thread Type Markings	139
C.48 Marking Requirements and Sequence	140
C.49 Retention of Records	144
C.50 SR 11.1-Distance between Plates for Flattening Tests	144
C.51 SR 12.1-Inspection Lot Sample Sizes and F Factor	145
C.52 SR 12.2-Probability of Defective Product	145
C.53 SR 16.1-Transverse Impact Specimen Size Required	146
C.54 SR 16.2-Longitudinal Impact Specimen Size Required	147
C.55 SR 16.3-Acceptable Size Impact Specimens and Absorbed Energy Reduction Factor	148
C.56 SR 16.4-Hierarchy of Test Specimen Orientation and Size	148
C.57 SR 16.7-Test Temperature Reduction for Sub-size Specimens for Grades H40, J55, and K55 Only ..	148
C.58 Enhanced Leak Resistance SR 22.1	149
E.1 API Casing Line (sizes, masses, wall thickness, grade, and applicable end-finish)	182
E.2 API Tubing Line (sizes, masses, wall thickness, grade, and applicable end-finish)	185
E.3 Process of Manufacture and Heat Treatment	186
E.4 Chemical Composition, Mass Fraction (%)	187
E.5 Tensile and Hardness Requirements	188
E.6 Elongation Table	189
E.7 Critical Thickness for Couplings with API Threads	192
F.3 Acceptable Size Impact Specimens and Absorbed Energy Reduction Factor	193
F.4 Hierarchy of Test Specimen Orientation and Size	193
E.10 Charpy Impact Test Specimen Requirements for Couplings, Coupling Stock, Coupling Material, Coupling Blanks, and Accessory Material for Grades J55 and K55	194
E.11 Charpy Impact Test Specimen Requirements for Couplings, Coupling Stock, Coupling Material, Coupling Blanks, and Accessory Material for Grade L80 (All Types)	195

Contents

Page

E.12 Charpy Impact Test Specimen Requirements for Couplings, Coupling Stock, Coupling Material, Coupling Blanks, and Accessory Material for Grade C90	196
E.13 Charpy Impact Test Specimen Requirements for Couplings, Coupling Stock, Coupling Material, Coupling Blanks, and Accessory Material for Grades N80 Type 1, N80Q, R95, and T95	197
E.14 Charpy Impact Test Specimen Requirements for Couplings, Coupling Stock, Coupling Material, Coupling Blanks, and Accessory Material for Grade P110	198
E.15 Charpy Impact Test Specimen Requirements for Couplings, Coupling Stock, Coupling Material, Coupling Blanks, and Accessory Material for Grade Q125	199
E.16 Transverse Charpy Absorbed Energy Requirements for Couplings, Coupling Stock, Coupling Material, Coupling Blanks, and Accessory Material	200
E.17 Longitudinal Charpy Absorbed Energy Requirements for Couplings, Coupling Stock, Coupling Material, Coupling Blanks, and Accessory Material	201
E.18 Transverse Charpy Absorbed Energy Requirements for Pipe	202
E.19 Longitudinal Charpy Absorbed Energy Requirements for Pipe	203
E.20 Transverse Impact Specimen Size Required for Quenched and Tempered Product	204
E.21 Longitudinal Impact Specimen Size Required for Quenched and Tempered Product	205
E.22 Distance between Plates for Electric-weld Flattening Tests	206
E.23 Dimensions and Masses for Standard Casing and for Casing Threaded with API Round Thread and Buttress Thread	207
E.24 Dimensions and Masses for Standard Tubing and for Tubing Threaded with API Non-upset, External Upset, and Integral Tubing Connections	212
E.25 External Upset Tubing Dimensions for API Connections for Grades H40, J55, L80 (All Types), R95, N80 (All Types), C90, T95, and P110	215
E.26 Integral Tubing Connection Dimensions for API Connections for Grades H40, J55, L80 (All Types), R95, N80 (All Types), C90, and T95	216
E.27 Range Lengths	217
E.28 Standard Drift Size	217
E.29 Alternative Drift Size	218
E.30 Maximum Permissible Depth of Linear Imperfections	218
E.31 Upset Products-Maximum Permissible Depth of Imperfections	219
E.32 API Round-thread Casing Coupling-Dimensions, Tolerances, and Masses	220
E.33 API Buttress Thread Casing Coupling-Dimensions, Tolerances, and Masses	221
E.34 API Non-upset Tubing Coupling-Dimensions, Tolerances, and Masses	222
E.35 API External-upset Tubing Coupling-Dimensions, Tolerances, and Masses	223
E.36 Permissible Depth of External Imperfections on Coupling (Dimensions in inches)	223
E.37 Frequency of Tensile Tests-Casing and Tubing	224
E.38 Frequency of Tensile Tests-Coupling Stock, Coupling Material, and Coupling Blanks	225
E.39 Frequency of Tensile Testing-Pup Joints and Accessory Material	226
E.40 Frequency of Hardness Testing	227
E.41 Frequency of Flattening Tests	229
E.42 Summary of NDE Methods for Seamless Pipe, Coupling Stock, Body of Welded Pipe, and Accessory Material (in accordance with 10.15.11)	230
E.43 Acceptance (Inspection) Levels	231
E.44 Artificial Reference Indicators	232
E.45 Size of Stamp Markings	232
E.46 Grade Color Codes	233
E.47 Thread Type Markings	233
E.48 Marking Requirements and Sequence	234

Contents

	Page
E.49 Retention of Records	238
E.50 SR 11.1-Distance between Plates for Flattening Tests	239
E.51 SR 12.1-Inspection Lot Sample Sizes vs F Factor	239
E.52 SR 12.2-Probability of Defective Product	239
E.53 SR 16.1-Transverse Impact Specimen Size Required	240
E.54 SR 16.2-Longitudinal Impact Specimen Size Required	241
E.55 SR 16.3-Acceptable Size Impact Specimens and Absorbed Energy Reduction Factor	242
E.56 SR 16.4-Hierarchy of Test Specimen Orientation and Size	242
E.57 SR 16.7-Test Temperature Reduction for Sub-size Specimens for Grades H40, J55, and J55 Only	242
E.58 Enhanced Leak Resistance SR 22.1	243
G.1 Drift Constants	250
G.2 Plane-end Pipe Hydrostatic Test Factors by Grade and Size	258
H.1 Reference Table for PSL-2 and PSL-3 Requirements	267
I.1 Axial Impact Test Using 38 mm (1.5 in.) Diameter Steel Bar	271
I.2 Angular (45°) Impact Test Using a Flat Steel Plate	271
Figures	
D.1 Short Round-thread Casing and Coupling	153
D.2 Long Round-thread Casing and Coupling	153
D.3 Buttress-thread Casing and Coupling	154
D.4 Non-upset Tubing and Coupling	155
D.5 External-upset Tubing and Coupling	156
D.6 Rounded Nose for External-upset Tubing	157
D.7 Integral-joint Tubing	157
D.8 Tensile Test Specimens	158
D.9 Example Location of Test Samples Removed from Product	159
D.10 Through-wall Hardness Test	160
D.11 Impact Test Specimen Orientation	161
D.12 Charpy Specimen Dimensions	161
D.13 Measuring Full-length Straightness	162
D.14 Measuring End Straightness	162
D.15 Examples of Marking Requirements and Sequence for Manufacturers and Threaders Using Section 11 and Table C.48 or E.48	163
D.16 Reference Indicator	166
D.17 SR 13.1 Seal-ring Coupling and Non-metallic Ring for Round-thread Casing	168
D.18 SR 13.2 Seal-ring Coupling and Non-metallic Ring for Buttress-thread Casing	169
D.19 SR 13.3 Seal-ring Coupling and Non-metallic Ring for Non-upset Tubing	170
D.20 SR 13.4 Seal-ring Coupling and Non-metallic Ring for Upset Tubing	171
D.21 SR 16	172
D.22 Examples of Marking Requirements and Sequence for Manufacturers and Threaders Using the API Monogram (Annexes A and F), Section 11, and Table C.48 or E.48	173
D.23 SR 22.1 Field-end Paint Mark and Triangle Stamp (Stamp on Mill and Field Ends)	176
D.24 SR 22.2 Optional Tapered Bore along Inside Diameter Specifications	177
D.25 Example of a 90° Hook-type Tool	178
D.26 Axial Impact Test Apparatus	179
D.27 45° Impact Test Apparatus	179
D.28 Stripping Test Apparatus	180
D.29 Seal-ring Paint Band Example	180
D.30 Location of Hardness Impressions on DCB Specimen	181

Casing and Tubing

1 Scope

1.1 Coverage

This standard specifies the technical delivery conditions for steel pipes (casing, tubing, and pup joints), coupling stock, coupling material, and accessory material, and establishes requirements for three product specification levels (PSL-1, PSL-2, and PSL-3). The requirements for PSL-1 are the basis of this standard. The requirements that define different levels of standard technical requirements for PSL-2 and PSL-3, for all grades (except H-40, L 80 9Cr, and C110) are provided.

For pipes covered by this standard, the sizes, masses, and wall thicknesses, as well as grades and applicable end-finishes, are provided. API 5L pipe may be ordered as casing in accordance with API 5C6.

By agreement between the purchaser and manufacturer, this standard can also be applied to other plain-end pipe sizes and wall thicknesses.

1.2 Applicability—Connections

This standard is applicable to the following connections in accordance with API 5B:

- short round thread casing (SC)
- long round thread casing (LC)
- buttress thread casing (BC)
- non-upset tubing (NU)
- external upset tubing (EU)
- integral tubing (IJ)

For such connections, this standard specifies the technical delivery conditions for couplings and thread protection. Supplementary requirements that can optionally be agreed upon for enhanced leak resistance connections (LC) are provided.

This standard can also be applied to tubulars with connections not covered by API standards.

This standard is not applicable to threading requirements.

NOTE Dimensional requirements on threads and thread gauges, stipulations on gauging practice, gauge specifications, as well as instruments and methods for inspection of threads, are given in API 5B.

1.3 Applicability—Grades

The products to which this standard is applicable include the following grades: H40, J55, K55, N80 (all types), L80 (all types), C90, R95, T95, P110, C110, and Q125.