

DIN EN ISO 11960:2011-09 (E)

Petroleum and natural gas industries - Steel pipes for use as casing or tubing for wells (ISO 11960:2011); English version EN ISO 11960:2011, only on CD-ROM

Inhalt	Seite
Foreword	13
Introduction.....	14
1 Scope.....	15
2 Conformance	16
2.1 Dual referencing of normative references.....	16
2.2 Units of measurement	16
3 Normative references	16
4 Terms, definitions, symbols and abbreviated terms	19
4.1 Terms and definitions.....	19
4.2 Symbols and abbreviated terms.....	23
5 Information to be supplied by the purchaser.....	24
5.1 Grades C90, T95 and C110	24
5.2 Casing	24
5.3 Tubing	26
5.4 Coupling stock, coupling material and accessory material	27
6 Process of manufacture	28
6.1 General.....	28
6.2 Heat treatment	28
6.2.1 General	28
6.2.2 Group 1 (except H40).....	28
6.2.3 Group 2.....	28
6.3 Straightening	29
6.3.1 Groups 1 (except Grade R95) and 3	29
6.3.2 Grade R95	29
6.3.3 Grades M65 and L80	29
6.3.4 Grades C90 and T95.....	29
6.3.5 Grade C110	29
6.3.6 Grade Q125	29
6.4 Traceability	30
6.4.1 General.....	30
6.4.2 Serialization of Grades C90, T95, C110 and Q125	30
6.5 Processes requiring validation.....	30
7 Material requirements.....	30
7.1 Chemical composition.....	30
7.2 Tensile properties	31
7.2.1 General	31
7.2.2 Elongation — All groups	31
7.2.3 Yield strength	31
7.2.4 Statistical tensile testing – Grades C90, T95 and C110	31
7.3 Charpy V-notch test — General requirements	32
7.3.1 Evaluation of test results	32
7.3.2 Critical thickness	32
7.3.3 Specimen size and orientation	32
7.3.4 Hierarchy of test specimens	32
7.3.5 Alternative size impact test specimens	33
7.3.6 Sub-size test specimens	33
7.3.7 Test temperature	33

7.3.8	Statistical impact testing	33
7.3.9	Reference information	33
7.4	Charpy V-notch — Absorbed energy requirements for coupling stock, coupling material, coupling blanks and couplings.....	33
7.4.1	General	33
7.4.2	Grade H40.....	33
7.4.3	Grades J55 and K55 for API threads	33
7.4.4	Grade M65 for API threads	34
7.4.5	Grades N80 Type 1, N80Q and R95, Groups 2 (except Grades M65 and C110), 3 and 4 for API threads.....	34
7.4.6	Special end-finish.....	34
7.5	Charpy V-notch — Absorbed energy requirements for pipe	34
7.5.1	Grades H40, J55, K55 and N80 Type 1	34
7.5.2	Grade M65	34
7.5.3	Grades N80Q, R95, L80, C90, T95 and P110	35
7.5.4	Grades C110 and Q125	35
7.5.5	Test specimen.....	36
7.5.6	Testing conditions.....	36
7.6	Charpy V-notch — Absorbed energy requirements for accessory material	36
7.6.1	Accessory material — General	36
7.6.2	Accessory material for accessories with internal API threads except integral tubing connections	36
7.6.3	Accessory material for accessories with internal special end-finish tapered interference- type threads	36
7.6.4	Accessory material for accessories with external threads.....	36
7.6.5	Accessory material for accessories with either integral tubing connections or internal special end-finish connections that do not have thread interference	36
7.6.6	Critical thickness for accessory material and special end-finish material	36
7.7	Maximum hardness	37
7.7.1	Group 2 — All product	37
7.7.2	Grade Q125 — All products.....	37
7.8	Hardness variation — Grades C90, T95, C110 and Q125	37
7.9	Process control — Grades C90, T95, C110 and Q125	37
7.10	Hardenability — Minimum percentage martensite for quenched and tempered products	38
7.10.1	Grades C90 and T95.....	38
7.10.2	Grade C110.....	38
7.10.3	All grades except Grades C90, T95 and C110	38
7.11	Grain size — Grades C90, T95 and C110	38
7.12	Surface condition — Grades L80 9Cr and L80 13Cr	38
7.13	Flattening — Electric-welded pipe.....	39
7.14	Sulfide stress cracking test — Grades C90, T95 and C110.....	39
7.14.1	General guidance	39
7.14.2	Test and re-test requirements.....	39
7.14.3	Test sample selection and location.....	39
7.14.4	Test solution for Grades C90, T95 and C110.....	40
7.14.5	Minimum SSC requirements	40
7.14.6	Invalidation of tests.....	41
7.14.7	Additional testing provisions for ANSI-NACE TM0177-2005 Method D.....	41
8	Dimensions, masses, tolerances, pipe ends and defects.....	41
8.1	Labels and sizes	41
8.2	Dimensions and masses	41
8.3	Diameter	42
8.3.1	Measurement and design	42
8.3.2	Requirements.....	42
8.4	Wall thickness.....	42
8.5	Mass.....	43
8.6	Length.....	43
8.7	Casing jointers.....	43
8.8	Height and trim of electric-weld flash	43
8.8.1	Trimming electric-weld flash.....	43

8.8.2	Groups 1 and 2	44
8.8.3	Groups 3 and 4	44
8.8.4	Disposition.....	44
8.9	Straightness	44
8.9.1	Pipe.....	44
8.9.2	Coupling stock, coupling material and accessory material	44
8.10	Drift requirements	44
8.11	Tolerances on dimensions and masses	45
8.11.1	Outside diameter.....	45
8.11.2	Wall thickness	45
8.11.3	Mass	45
8.11.4	Inside diameter.....	46
8.11.5	Upset dimensions	46
8.11.6	Extended length upsets.....	46
8.12	Product ends	46
8.12.1	Plain-end pipe.....	46
8.12.2	Product with API threads	46
8.12.3	Rounded nose	46
8.12.4	Threading	47
8.12.5	Workmanship of ends.....	47
8.12.6	Special end-finish	47
8.13	Defects	47
8.13.1	Pipe and accessory made from pipe.....	47
8.13.2	Accessory material not made from pipe, coupling stock and coupling material.....	48
8.13.3	Process control plan.....	48
8.14	Coupling make-up and thread protection.....	48
8.14.1	Groups 1, 2 and 3	48
8.14.2	Group 4.....	48
9	Couplings.....	49
9.1	General requirements	49
9.2	Alternative grades or heat treatments	49
9.3	Mechanical properties	50
9.4	Dimensions and tolerances	50
9.4.1	Groups 1, 2 and 3	50
9.4.2	Group 4.....	50
9.5	Regular couplings.....	50
9.6	Special-clearance couplings — Groups 1, 2 and 3.....	50
9.7	Combination couplings	50
9.8	Reducing couplings — Groups 1, 2 and 3.....	50
9.9	Seal-ring couplings.....	51
9.10	Special-bevel tubing regular couplings — Groups 1, 2 and 3.....	51
9.11	Threading	51
9.11.1	General requirements	51
9.11.2	Couplings.....	51
9.12	Surface inspection	51
9.13	Measurement of imperfections.....	52
9.14	Repair and removal of imperfections and defects	52
9.15	Thread surface treatment — Grade Q125.....	52
9.16	Couplings and coupling blank protection — Grades C90, T95, C110 and Q125	52
10	Inspection and testing	53
10.1	Test equipment.....	53
10.2	Lot definition for testing of mechanical properties	53
10.2.1	Groups 1, 2 (Grades M65 and L80 Type 1 only) and 3 — Coupling stock, coupling material and pipe (except pup joints heat-treated after cutting to blank or individual length)	53
10.2.2	Grades L80 9Cr, L80 13Cr, C90, T95, C110 and Q125 — Coupling stock, coupling material and pipe (except pup joints heat-treated after cutting to blank or individual length)	53
10.2.3	Coupling blanks, pup joints or accessory material heat-treated after cutting to blank or individual length.....	53
10.3	Testing of chemical composition	53
10.3.1	Heat analyses	53

10.3.2	Product analyses	54
10.3.3	Test method	54
10.3.4	Re-check of product analyses — All groups	54
10.4	Tensile tests	54
10.4.1	Stress-relief temperature — All grades except C110	54
10.4.2	Heat-control tensile tests — Groups 1, 2 and 3	54
10.4.3	Frequency of testing and location of test specimen — Casing and tubing	55
10.4.4	Frequency of testing and test specimen location — Coupling stock, coupling material, coupling blanks, pup joints and accessory material	55
10.4.5	Test specimens — General	55
10.4.6	Test specimens — Additional requirements for coupling blanks, coupling stock coupling material and pup joint and accessory materials — Grades C110 and Q125	56
10.4.7	Test method	56
10.4.8	Invalidation of tests	56
10.4.9	Re-tests — All products (except coupling blanks, coupling stock, coupling material, pup joints or accessory material) — Grades C90, T95, C110 and Q125)	56
10.4.10	Re-tests — Coupling blanks, coupling stock, coupling material, pup joints or accessory material in Grades C90, T95, C110 and Q125	56
10.5	Flattening test	57
10.5.1	General requirement for testing	57
10.5.2	Frequency of testing	57
10.5.3	Test specimens	57
10.5.4	Test method for Groups 1 and 2	57
10.5.5	Test method for Grade P110 pipe and Grade Q125 casing	57
10.5.6	Invalidation of tests	57
10.5.7	Re-tests	58
10.6	Hardness test	58
10.6.1	PSL requirements	58
10.6.2	Frequency of testing — General	58
10.6.3	Frequency of testing — Heat-control tests — Grades M65 and L80	58
10.6.4	Frequency of testing — Grades M65 and L80	58
10.6.5	Frequency of testing and test specimen location — Non-upset pipe — Grades C90, T95 and C110	58
10.6.6	Frequency of testing and test specimen location — Upset pipe — Grades C90 and T95	59
10.6.7	Frequency of testing and test specimen location — Coupling blanks, coupling stock, coupling material, pup joints and accessory material — Grades C90, T95 and C110	59
10.6.8	Frequency of testing — Grade Q125	59
10.6.9	Test specimens	59
10.6.10	Test method	59
10.6.11	Invalidation of tests	61
10.6.12	Periodic checks of hardness-testing machines	61
10.6.13	Verification of hardness-testing machines and indenters	62
10.6.14	Re-tests — Grades M65 and L80	63
10.6.15	Re-tests — Grades C90, T95 and C110 products except for coupling blanks, pup joints or accessory material heat-treated after cutting to individual lengths	63
10.6.16	Re-tests — Grades C90, T95 and C110 coupling blanks, pup joints or accessory material heat-treated after cutting to individual lengths	63
10.6.17	Re-tests — Grade Q125 — General	63
10.6.18	Re-tests — Grade Q125 — Casing, coupling stock and coupling material	64
10.6.19	Re-tests — Grade Q125 — Coupling blanks, pup joints and accessory material	64
10.6.20	Rejected lots — Groups 2 and 4	64
10.7	Impact test	64
10.7.1	Sampling — Grades J55, K55 and N80 Type 1	64
10.7.2	Sampling — Grade M65	64
10.7.3	Sampling — Grades N80Q, R95, L80, C90, T95, C110 and P110	64
10.7.4	Sampling and test specimen location — Grade Q125	64
10.7.5	Test specimens	65
10.7.6	Test method	65
10.7.7	Invalidation of tests	65
10.7.8	Re-test of a length — All groups	65
10.7.9	Replacement of a reject length — All groups	65

10.7.10	Multiple length rejection — Grade Q125.....	65
10.8	Grain size determination — Grades C90, T95 and C110.....	66
10.8.1	Sampling.....	66
10.8.2	Test method.....	66
10.9	Hardenability — Grades C90, T95 and C110.....	66
10.10	Sulfide stress-cracking test — Grades C90, T95 and C110.....	66
10.11	Metallographic evaluation — EW Grades P110 and Q125.....	66
10.12	Hydrostatic tests.....	66
10.12.1	Hydrostatic test procedures.....	66
10.12.2	Hydrostatic test requirements.....	67
10.12.3	Test pressure calculation.....	68
10.13	Dimensional testing.....	68
10.13.1	General.....	68
10.13.2	Diameter measurement.....	69
10.13.3	Diameter re-tests.....	69
10.13.4	Wall thickness measurement.....	69
10.13.5	Drift test.....	70
10.13.6	Length measurement.....	70
10.13.7	Mass (weight) determination.....	70
10.13.8	Straightness evaluation.....	71
10.13.9	Internal upset inspection.....	71
10.14	Visual inspection.....	71
10.14.1	General.....	71
10.14.2	Pipe body, coupling stock and coupling material (excluding pipe ends).....	71
10.14.3	Pipe ends.....	71
10.14.4	Disposition.....	72
10.15	Non-destructive examination (NDE).....	72
10.15.1	General.....	72
10.15.2	NDE personnel.....	72
10.15.3	Reference standards.....	72
10.15.4	NDE system capability records.....	73
10.15.5	Pipe body or coupling stock inspection — General.....	73
10.15.6	Full-body, full-length NDE of casing and tubing — Grades N80Q, M65, L80 and R95.....	74
10.15.7	Full-body, full-length NDE of casing and tubing — Grade P110 to A.10 SR16.....	74
10.15.8	Full-body, full-length NDE of casing and tubing — Grade P110 and Grade P110 to A.10 SR16 and A.3 SR2.....	74
10.15.9	Full-body, full-length NDE of casing and tubing — Grades C90, T95, C110 and Q125.....	75
10.15.10	NDE of the weld seam of welded pipe.....	75
10.15.11	Coupling stock (except Grade C110) and pup joints.....	75
10.15.12	NDE of coupling stock and accessory material – Grade C110.....	76
10.15.13	Un-tested pipe ends, coupling stock ends and accessory material ends.....	77
10.15.14	Pipe upsets.....	77
10.15.15	Pipe, coupling stock and accessory material requiring further evaluation.....	77
10.15.16	Evaluation of indications (prove-up).....	77
10.15.17	Disposition of pipe containing defects.....	78
10.15.18	Disposition of coupling stock and accessory material containing defects.....	79
11	Marking.....	80
11.1	General.....	80
11.2	Stamp marking requirements.....	81
11.2.1	Methods.....	81
11.2.2	Size.....	81
11.2.3	Location.....	81
11.2.4	Group 1 (except R95) and Group 3.....	81
11.2.5	Grade R95 and Groups 2 and 4.....	81
11.2.6	Make-up triangle marking.....	82
11.3	Stencil marking requirements.....	82
11.4	Colour identification.....	82
11.4.1	Colour coding.....	82
11.4.2	Product 1,8 m (6 ft) and longer.....	82
11.4.3	Loose couplings.....	83

11.4.4	Special-clearance couplings	83
11.4.5	Pup joints shorter than 1,8 m (6 ft) in length	83
11.4.6	Grade colour-codes	83
11.5	Thread and end-finish marking — All groups	83
11.5.1	API thread marking	83
11.5.2	Plain-end and special end-finish markings	83
11.6	Pipe-threader marking requirements — All groups	83
12	Coating and protection	84
12.1	Coatings — All groups	84
12.1.1	Coatings for protection during transit	84
12.1.2	Coatings for long-term storage	84
12.2	Thread protectors	85
12.2.1	General	85
12.2.2	Grade L80 Types 9Cr and 13Cr	85
12.2.3	Driftable thread protectors	85
13	Documents	85
13.1	Electronic media — All groups	85
13.2	Certification — Groups 1, 2 (except Grade C110) and 3	85
13.3	Certification requirements — Grades C110 and Q125	86
13.4	Retention of records	86
14	Minimum facility requirements for various categories of manufacturer	86
14.1	Pipe mill	86
14.2	Processor	86
14.3	Pipe threader	86
14.4	Coupling, pup-joint or accessory manufacturer	87
Annex A	(normative) Supplementary requirements	88
A.1	General	88
A.2	SR1 Supplementary non-destructive examination for Grades H40, J55, K55 and N80 Type 1	88
A.3	SR2 Supplementary non-destructive examination for Grades H40, J55, K55, N80 Type 1, N80Q, M65, L80, R95 and P110 to A.10 SR16	88
A.4	SR9 Coupling blanks — Grades C110 and Q125	88
A.4.1	SR9.1 Coupling blank size	88
A.4.2	SR9.2 Dimensional tolerances	88
A.4.3	SR9.3 Imperfections	89
A.4.4	SR9.4 Marking	89
A.5	SR10 Upset casing — Grade Q125 only	89
A.5.1	SR10.1 Dimensions	89
A.5.2	SR10.2 Material properties	89
A.5.3	SR10.3 Heat treatment	89
A.5.4	SR10.4 Other testing considerations	89
A.5.5	SR10.5 End area inspection	89
A.6	SR11 Electric-welded Grades P110 and Q125 pipe	89
A.6.1	SR11.1 General	89
A.6.2	SR11.2 Flattening test frequency	90
A.6.3	SR11.3 Flattening test procedures	90
A.6.4	SR11.4 Other material properties	90
A.6.5	SR11.5 Inspection and rejection	90
A.7	SR12 Statistical impact testing	91
A.7.1	SR12.1 General	91
A.7.2	SR12.2 Frequency of testing	92
A.7.3	SR12.3 Re-test	92
A.7.4	SR12.4 Acceptable impact energy for any lot of product	92
A.7.5	SR12.5 Lot acceptance/rejection	92
A.8	SR13 Seal-ring couplings	93
A.8.1	SR13.1 Seal-ring groove	93
A.8.2	SR13.2 Non-metallic ring	93
A.8.3	SR13.3 Marking	94
A.9	SR15 Test certificates	94
A.9.1	SR15.1	94

A.9.2	SR15.2	95
A.10	SR16 Impact testing (Charpy V-notch)	96
A.10.1	SR16.1 Testing requirements.....	96
A.10.2	SR16.2 Charpy V-notch test — General requirements.....	96
A.10.3	SR16.3 Charpy V-notch test — Impact requirements for pipe and for accessory material for externally threaded accessories.....	97
A.10.4	SR16.4 Accessory material for accessories with integral joint API tubing connections	97
A.10.5	SR16.5 Accessory material for accessories with internal special end-finish connections that do not have thread interference.....	98
A.10.6	SR16.6 Impact test procedures	98
A.10.7	SR16.7 Reporting	99
A.10.8	SR16.8 Marking	99
A.11	SR22 Enhanced leak resistance, LC	99
A.11.1	General.....	99
A.11.2	SR22 Enhanced leak resistance	100
A.12	SR38 Statistical tensile testing — Grades C90, T95 and C110.....	101
A.12.1	SR38.1 General.....	101
A.12.2	SR 38.2 Frequency of testing.....	102
A.12.3	SR38.3 Yield strength determination	102
A.12.4	SR38.4 Additional testing to qualify a lot	102
A.12.5	SR38.5 Retests to qualify a pipe.....	102
A.13	SR39 Alternative ANSI-NACE TM0177-2005 Method D Sulfide stress cracking (SSC) tests — Grade C110.....	102
A.13.1	SR39.1 Test requirements	102
A.13.2	SR39.2 Test sample selection and location	103
A.13.3	SR39.3 Alternative test solution	103
A.13.4	SR39.4 Test conditions.....	103
A.13.5	SR39.5 Invalidation of tests	103
A.13.6	SR39.6 Additional testing provisions	103
A.14	SR40 Electric-welded casing, tubing and pup joints, Groups 1 & 2.....	104
A.14.1	SR40.1 Height and trim of electric-weld flash.....	104
A.14.2	SR40.2 Non-destructive examination of weld seam	104
Annex B	(normative) Purchaser inspection.....	105
B.1	Inspection notice.....	105
B.2	Plant access	105
B.3	Compliance	105
B.4	Rejection	105
Annex C	(normative) Tables in SI units	106
Annex D	(normative) Figures in SI (USC) units	157
Annex E	(normative) Tables in USC units	185
Annex F	(informative) Use of the API Monogram by Licensees.....	235
F.1	General	235
F.2	References	235
F.3	API monogram programme — Licensee responsibilities	235
F.3.1	Maintaining a license to use the API monogram	235
F.3.2	Monogrammed product — Conformance with API Spec Q1	236
F.3.3	Application of the API monogram	236
F.3.4	Records	236
F.3.5	Quality program changes.....	236
F.3.6	Use of the API Monogram in advertising.....	237
F.4	Marking requirements for products	237
F.4.1	General.....	237
F.4.2	Stamp marking requirements	238
F.4.3	Stencil marking requirements.....	239
F.4.4	Colour identification	239
F.4.5	Thread and end-finish marking — All groups	240
F.4.6	Pipe threader marking requirements — All groups.....	240
F.5	API Monogram Program — API responsibilities.....	241

Annex G (informative) Procedures used to convert from USC units to SI units	242
G.1 Background.....	242
G.2 General	242
G.2.1 Rounding.....	242
G.2.2 Fractions	242
G.2.3 Tolerances.....	242
G.3 Pipe dimensions	243
G.3.1 Outside diameter	243
G.3.2 Wall thickness.....	243
G.3.3 Inside diameter	243
G.3.4 Diameters and lengths of upsets.....	243
G.4 Drift diameters	244
G.4.1 Drift diameter, standard drift size, Table C.28.....	244
G.4.2 Drift diameter, alternative drift size, Table C.29	244
G.5 Coupling dimensions	245
G.5.1 Length of couplings	245
G.5.2 Diameter of coupling recess	245
G.5.3 Width of the coupling bearing face	245
G.5.4 Diameter at the root of the coupling thread at the end of the pipe in the power-tight position.....	245
G.6 Linear mass.....	246
G.6.1 Nominal threaded and coupled linear mass	246
G.6.2 Plain-end linear mass.....	246
G.6.3 Coupling masses	246
G.6.4 Mass gain or loss due to end finish	247
G.7 Tensile and flattening tests	247
G.7.1 Yield strength.....	247
G.7.2 Tensile strength.....	247
G.7.3 Elongation	247
G.7.4 Flattening test formula.....	248
G.8 Charpy impact energy requirements.....	248
G.8.1 Critical thickness for couplings with API threads, Table C.7	248
G.8.2 Charpy impact energy.....	248
G.8.3 Minimum absorbed energy requirements for couplings, Tables C.11 to C.17.....	249
G.8.4 Absorbed energy requirements for pipe.....	249
G.8.5 Calculated wall thickness required to machine transverse and longitudinal Charpy impact specimens from pipe and couplings, Tables C.20 and C.21	250
G.9 Hydrostatic testing	251
G.9.1 Hydrostatic test pressure for plain-end pipe.....	251
G.9.2 Hydrostatic test pressure for couplings	251
G.9.3 Internal pressure leak-resistance at E1 or E7 plane	252
G.9.4 Hydrostatic test pressure for threaded and coupled pipe	252
G.10 Other	252
G.10.1 Temperature.....	252
G.10.2 Torque.....	253
Annex H (normative) Product Specification Levels.....	254
H.1 General	254
H.2 Heat treatment	254
H.2.1 Grade J55 and K55, PSL-2 (6.2.2)	254
H.2.2 Grade N80Q, PSL-3 (6.2.2)	254
H.3 Straightening, PSL-2	254
H.3.1 Grades C90 and T95 (6.3.4)	254
H.3.2 Grades R95 and P110 (6.3.1, 6.3.3)	254
H.4 Chemical composition Grades C90 and T95, PSL-3 (7.1).....	255
H.5 Yield strength — Grade Q125, PSL-3 (7.2.3).....	255
H.6 Charpy V-notch tests	255
H.6.1 Charpy V-notch test properties — General requirements, Grades N80 Type 1, N80Q, L80 Type 1, C90, R95, T95, P110 and Q125, PSL-2 (7.3.1).....	255
H.6.2 Charpy V-notch — Absorbed energy requirements for pipe, PSL-2.....	255
H.7 Hardenability — Minimum percentage martensite required for quenched and tempered products	255

H.7.1	Grade L80 Type 1, PSL-2 (7.10.3)	255
H.7.2	Grades C90 AND T95, PSL-3 (7.10.1)	256
H.8	Inside surface preparation — Grade L80 13Cr, PSL-2 (7.12)	256
H.9	Sulfide stress-cracking (SSC) test — PSL-3	256
H.9.1	Grades C90 and T95 (7.14)	256
H.9.2	Grade L80 13Cr	256
H.10	Processing of pin ends — All groups, PSL-2 (8.12.5)	256
H.11	Seal-ring couplings — All groups, PSL-2 (9.9)	256
H.12	Processing of box ends — All groups, PSL-2 (9.11.1)	257
H.13	Frequency of tensile testing — Casing and tubing, Grades N80 Type 1, and N80Q, PSL-2 (10.4.3)	257
H.14	Hardness testing, PSL-3	257
H.14.1	Hardness test — Grades N80Q, L80 Type 1, R95, P110 and Q125 (10.6.1, 10.6.4 and 10.6.8)	257
H.14.2	Sampling and test specimen location — Non-upset pipe, Grades C90 and T95 (10.6.5)	257
H.15	Metallographic evaluation for EW pipe — Grades J55, K55, M65, N80 Type 1, N80Q, L80 Type 1, and R95, PSL-2 (10.11)	257
H.16	Hydrostatic test — Grades J55 and K55, PSL-2 (10.12.2)	257
H.17	Wall thickness (10.13.4)	257
H.17.1	All groups, PSL-2	257
H.17.2	All groups, PSL-3	258
H.18	Non-destructive examination (NDE)	258
H.18.1	Full-body, full-length NDE — Casing and tubing	258
H.18.2	NDE of the weld seam of welded pipe — Grades K55 and M65, PSL-2 (10.15.10)	258
H.18.3	NDE of pipe ends — All groups, PSL-3 (10.15.13)	258
H.18.4	NDE of coupling stock — Groups 1 (Grade R95 only), 2, 3 and 4, PSL-2 (10.15.11)	259
H.18.5	NDE of coupling stock — Groups 1 (Grade R95 only), 2, 3 and 4, PSL-3 (10.15.11)	259
H.19	Certification requirements — Groups 1, 2 and 3, PSL-2 (13.2)	259
H.20	Non-metallic seal ring — All groups, PSL-2 (A.8.2)	259
Annex I (normative) Requirements for thread protector design validation		261
I.1	General	261
I.2	Validation procedure	261
I.3	Sample identification	262
I.4	Dimensional stability tests	262
I.5	Torque and vibration tests	262
I.6	Axial impact tests	262
I.7	Angular impact test	263
I.8	Corrosion test	263
I.9	Stripping test (pin end protector only)	264
I.10	Hookability (liftability) test	264
Annex J (informative) Summary of Product Specification Level (PSL) requirements		265
J.1	General	265
J.2	Grades J55 and K55	265
J.2.1	PSL-2	265
J.2.2	PSL-3	265
J.3	Grade M65	266
J.3.1	PSL-2	266
J.3.2	PSL-3	266
J.4	Grades N80 Type 1 and N80Q	266
J.4.1	PSL-2	266
J.4.2	PSL-3	267
J.5	Grade L80 Type 1	267
J.5.1	PSL-2	267
J.5.2	PSL-3	268
J.6	Grade L80 13Cr	268
J.6.1	PSL-2	268
J.6.2	PSL-3	268
J.7	Grades C90 and T95	269
J.7.1	PSL-2	269
J.7.2	PSL-3	269

J.8	Grade R95.....	269
J.8.1	PSL-2.....	269
J.8.2	PSL-3.....	270
J.9	Grade P110.....	270
J.9.1	PSL-2.....	270
J.9.2	PSL-3.....	271
J.10	Grade Q125.....	271
J.10.1	PSL-2.....	271
J.10.2	PSL-3.....	271
Annex K (normative) Modification of the hydrogen sulfide titration procedures in ANSI-NACE		
	TM0284-2003, Appendix C.....	272
K.1	Solution preparation for low hydrogen sulfide (H ₂ S) analyses.....	272
K.2	Titration procedures.....	272
K.3	Titration of H ₂ S in solution.....	272
Annex L (informative) Technical changes from the previous edition.....		
L.1	Introduction.....	273
L.2	Requirements for Group 2, Grade C110.....	273
L.3	Changes to non-destructive examination requirements.....	275
L.4	Changes to sulfide stress cracking requirements for Group 2, Grades C90 and T95.....	275
L.5	Changing Group 2, Grade C95 to Group 1, Grade R95.....	276
L.6	Change to Label-1: 7 coupling outside diameter.....	277
L.7	Introduction of "product test block" and "standardised test block".....	277
L.8	Change to requirements for NDE of weld seams.....	277
L.9	Change to requirements for weight tolerances.....	277
L.10	Requirements for imperfections in threaded sections.....	277
L.11	Requirements for marking seal ring couplings.....	278
L.12	Requirements for paint marking Grades L80 9Cr and L80 13Cr.....	278
L.13	Requirements for arc burns.....	278
L.14	Introduction of "coupling material".....	278
L.15	Deletion of plain-end liners.....	279
L.16	Deletion of extreme-line casing.....	280
L.17	Elimination of grade types for Grades C90, T95 and Q125.....	281
L.18	Changes to requirements for thread protector design validation.....	281
Bibliography.....		282