GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 75.200
E 98

GB/T 9711-2011

Replacing GB/T 9711.1-1996, GB/T 9711.2-1999, GB/T 9711.3-2005

Petroleum and Natural Gas Industries - Steel Pipe for Pipeline Transportation Systems

石油天然气工业

管线输送系统用钢管

(ISO 3183:2007, MOD)

Issued on: December 30, 2011 **Implemented on: June 1, 2012**

Issued by: General Administration of Quality Supervision, Inspection and Quarantine;

Standardization Administration of the People's Republic of China.

Table of Contents

Foreword

This Standard is drafted in accordance with the regulations of GB/T 1.1-2009.

This Standard replaces GB/T 9711.1-1996 “Petroleum and Natural Gas Industries - Steel Pipe for Pipelines - Technical Delivery Conditions - Part 1: Pipes of Requirement Class A”, GB/T 9711.2-1999 “Petroleum and Natural Gas Industries - Steel Pipe for Pipelines - Technical Delivery Conditions - Part 2: Pipes of Requirement Class B”, and GB/T 9711.3-2005 “Petroleum and Natural Gas Industries - Steel Pipe for Pipelines - Technical Delivery Conditions - Part 3: Pipes of Requirement Class C”.

This Standard uses redrafting method to modify and adopts ISO 3183:2007 (second edition) "Petroleum and Natural Gas Industries - Steel Pipe for Pipeline Transportation Systems". For ease of use, some changes are made in this Standard relative to ISO 3183:2007.

Editorial changes:

1) The second paragraph of 2.1 “Units of Measurement”, which is irrelevant to the subject of this Standard, namely "For data expressed in SI units, a comma is used as the decimal separator and a space is used as the thousand-separator. For data expressed in USC units, a dot (on the line) is used as the decimal separator and a space is used as the thousand-separator." is deleted.

2) The space is not used as the thousand-separator in SI unit and USC unit; the decimal point is used to replace the comma ", " that is used as the decimal separator in ISO 3183.

3) In the normative references, the international standards are replaced by the national standards and industry standards which are prepared equivalent and identical to the international standards; and the numbers of the international standards and the application degree are indicated in the parentheses.

4) In the normative reference, some international standards have been changed and prepared into the national standards and industry standards. For the reference, the corresponding standards number in China and the identical symbols are indicated in the notes below the international standards.

Technical modification:

1) The definitions for sample, test piece, informative elements, normative elements, heat, flux core arc welding and shielded metal arc welding are added; and they are listed in 4.55, 4.56, 4.57, 4.58, 4.59, 4.60, 4.61 respectively.

2) 7.2c) 55), 7.2c) 56), 7.2c) 57), 7.2c) 58), 7.2c) 59), 7.2c) 60), 7.2c) 61) are added.

Petroleum and Natural Gas Industries -

Steel Pipe for Pipeline Transportation Systems

1 Scope

This Standard specifies requirements for the manufacture of two product specification levels (PSL 1 and PSL 2) of seamless and welded steel pipes for use in pipeline transportation systems in the petroleum and natural gas industries.

This Standard is applicable to seamless and welded steel pipes for use in petroleum and natural gas transportation.

This Standard is not applicable to cast pipe.

2 Conformity

2.1 Units of measurement

In this Standard, data are expressed in both SI units and USC units. For a specific order item, unless otherwise stated, only one system of units shall be used, without combining data expressed in the other system.

2.2 Rounding

Unless otherwise stated in this Standard, to determine conformance with the specified requirements, observed or calculated values shall be rounded to the nearest unit in the last right-hand place of figures used in expressing the limiting value, in accordance with ISO 31-0:1992, Annex B, Rule A.

NOTE For the purposes of this provision, the rounding method of ASTM E 29-04[1] is equivalent to ISO 31-0:1992, Annex B, Rule A.

2.3 Compliance to this Standard

A quality system should be applied to assist compliance with the requirements of this Standard.

NOTE ISO/TS 29001[2] gives sector-specific guidance on quality management systems.

[1] American Petroleum Institute, 1220 L Street, N.W., Washington, DC 20005, USA.
[2] CEN, European Committee for Standardization, Central Secretariat, Rue de Stassart 36, B-1050, Brussels, Belgium. ISO 10474 is applied to this standard.

A contract can specify that the manufacturer shall be responsible for complying with all of the applicable requirements of this Standard. It shall be permissible for the purchaser to make any investigation necessary in order to be assured of compliance by the manufacturer and to reject any material that does not comply.

3 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.

GB/T 228 Metallic Materials – Tensile Testing at Ambient Temperature (GB/T 228-2002, eqv ISO 6892:1998)

GB/T 232 Metallic materials - Bend test (GB/T 232-1999, eqv ISO 7438:1985)

GB/T 244 Metallic materials - Tube (in full section) - Bend test(GB/T 244-2008, ISO 8491:1998, IDT)

GB/T 246 Metallic materials - Tube - Flattening test(GB/T-2007, ISO 8492:1998, IDT)

GB/T 2975 Steel and steel products - Location and preparation of samples and test pieces for mechanical testing (GB/T 2975-1998, eqv ISO 377:1997)

GB/T 4336 Standard test method for spark discharge atomic emission spectrometric analysis of carbon and low-Alloy steel (routine method)

GB/T 4340.1 Metallic materials-Vickers hardness test - Part 1: Test method (GB/T 4340.1-2009, ISO 6507-1:2005, MOD)

GB/T 4340.2 Metallic Vickers hardness test-Part 2: Verification of hardness testers (GB/T 4340.2-1999, idt ISO 6507-2:1997)

GB/T 4340.3 Metallic Vickers hardness test-Part 3: Calibration of hardness reference blocks (GB/T 4340.3-1999, idt ISO 6507-3:1997)

GB/T 8923-1988 Rust grades and preparation grades of steel surfaces before application of paints and related products (eqv ISO 8501-1:1988)

GB/T 9253.2 Petroleum and natural gas industries-Threading, gauging, and thread inspection of casing, tubing and line pipe threads (GB/T 9253.2-1999, idt API Spec 5B:1996[1)])

GB/T 15574 Steel products - Definitions and classification (GB/T 15574-1995, eqv ISO 6929:1987)

GB/T 15970.2 Corrosion of metals and alloys - Stress corrosion testing - Part 2: Preparation and use of bent- beam specimens (GB/T 15970.2-2000, ISO 7539.2:1989, IDT)

GB/T 17505 Steel and steel products - General technical delivery requirements (GB/T 17505-1998, eqv ISO 404:1992)

GB/T 17600.1 Steel - Conversion of elongation values - Part 1: Carbon and low alloy steels (GB/T 17600.1-1998, ISO 2566-1:1984, EQV)

GB/T 18253-2000 Steel and steel products - Inspection documents (ISO 10474:1991, EQV)

GB/T 19348.1-2003 Non-destructive testing - Industrial radiographic films - Part 1: Classification of film systems for industrial radiography (ISO 11699-1:1998, IDT)

GB/T 20066 Steel and iron - Sampling and preparation of samples for the determination of chemical composition (GB/T 20066-2006, ISO 14284:1996, IDT)

GB/T 23901.1-2009 Non-destructive testing-Image quality of radiographs-Part 1: Image quality indicators (wire type)-Determination of image quality value (ISO 19232.1:2004, IDT)

SY/T 6423.1-1999 Submerged arc-welded steel tubes for pressure purposes - Radiographic testing of the weld seam for the detection of imperfections (ISO 12096:1996, EQV)

SY/T 6423.2-1999 Electric resistance and induction welded steel tubes for pressure purposes - Ultrasonic testing of the weld seam for the detection of longitudinal imperfections (ISO 9764:1989, EQV)

SY/T 6423.3-1999 Submerged arc-welded steel tubes for pressure purposes - Ultrasonic testing of the weld seam for the detection of longitudinal and/or transverse imperfections (ISO 9765:1990, EQV)

SY/T 6423.4-1999 Welded steel tubes for pressure purposes - Ultrasonic testing of the area adjacent to the weld seam for the detection of laminar imperfections (ISO 13663:1995, EQV)

SY/T 6423.5-1999 Welded steel tubes for pressure purposes - Ultrasonic testing for the detection of laminar imperfections in strips/plates used in the manufacture of welded tubes (ISO 12094:1994, EQV)

SY/T 6423.6-1999 Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes - Ultrasonic testing for the detection of laminar imperfections (ISO 10124:1994, EQV)

NOTE: GB/T 20490-2006 is modified in relation to ISO 10124, 1994

SY/T 6423.7-1999 Seamless and welded steel tubes for pressure purposes - Ultrasonic testing of tube ends for the detection of laminar imperfections (ISO 11496:1996, EQV)

SY/T 6476 Practice for drop-weight tear tests on steel line pipe

ISO 31-0:1992, Quantities and units - Part 0: General principles

ISO 148-1, Metallic materials - Charpy pendulum impact test - Part 1: Test method

NOTE: GB/T 229-2007 is modified in relation to ISO 148-1:2006

ISO 4885, Ferrous products - Heat treatments - Vocabulary

ISO 6506 (all parts), Metallic materials - Brinell hardness test

NOTE: GB/T 231.1-2002 is equivalent to ISO 6506-1:1999; GB/T 231.2-2002 and GB/T 231.3-2002, are modified in relation to ISO 6506-2 and ISO6506-3:1999 respectively.

ISO 6508 (all parts), Metallic materials - Rockwell hardness test

NOTE: GB/T 230.1-2004, GB/T 230.2-2002 and GB/T 230.3-2002 are modified in relation to ISO 6508-1:1999, ISO 6508-2:1999 and ISO 6508-3:1999 respectively.

ISO 9303:1989, Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes - Full peripheral ultrasonic testing for the detection of longitudinal imperfections

ISO 9304:1989, Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes - Eddy current testing for the detection of imperfections

ISO 9305:1989, Seamless steel tubes for pressure purposes - Full peripheral ultrasonic testing for the detection of transverse imperfections

ISO 9402:1989, Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes - Full peripheral magnetic transducer/flux leakage testing of ferromagnetic steel tubes for the detection of longitudinal imperfections

ISO 9598:1989, Seamless steel tubes for pressure purposes - Full peripheral magnetic transducer/flux leakage testing of ferromagnetic steel tubes for the detection of transverse imperfections

ISO/TR 9769, Steel and iron - Review of available methods of analysis

ISO 10543, Seamless and hot-stretch-reduced welded steel tubes for pressure purposes - Full peripheral ultrasonic thickness testing

ISO 11484, Steel tubes for pressure purposes - Qualification and certification of non-destructive testing

ISO 12095, Seamless and welded steel tubes for pressure purposes - Liquid penetrant testing

ISO 12135, Metallic materials - Unified method of test for the determination of quasistatic fracture toughness

ISO 13664, Seamless and welded steel tubes for pressure purposes - Magnetic particle inspection of the tube ends for the detection of laminar imperfections

ISO 13665, Seamless and welded steel tubes for pressure purposes - Magnetic particle inspection of the tube body for the detection of surface imperfections

ISO 13678, Petroleum and natural gas industries - Evaluation and testing of thread compounds for use with casing, tubing and line pipe

ISO 15156-2:2003, Petroleum and natural gas industries - Materials for use in H2S-containing environments in oil and gas production - Part 2: Cracking-resistant carbon and low alloy steels, and the use of cast irons

NOTE: GB/T 20972.2-2008 is modified in relation to ISO 15156-2:2003.

EN 10204:2004[2], Metallic products - Types of inspection documents

API RP 5A3, Recommended Practice on Thread Compounds for Casing, Tubing, and Line Pipe

ASNT SNT-TC-1A[3], Recommended Practice No. SNT-TC-1A - Non-Destructive Testing

ASTM A 370[4], Standard Test Methods and Definitions for Mechanical Testing of Steel Products

ASTM A 435, Standard Specification for Straight-Beam Ultrasonic Examination of Steel Plates

ASTM A 578, Standard Specification for Straight-Beam Ultrasonic Examination of Plain and Clad Steel Plates for Special Applications

ASTM A 751, Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products

[3] American Society for Nondestructive Testing, 1711 Arlingate Lane, Columbus, OH 43228-0518, USA.
[4] ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA.

ASTM A 941, Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys

ASTM A 956, Standard Test Method for Leeb Hardness Testing of Steel Products

ASTM A 1038, Standard Practice for Portable Hardness Testing by the Ultrasonic Contact Impedance Method

ASTM E 8, Standard Test Methods for Tension Testing of Metallic Materials

ASTM E 18, Standard Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

ASTM E 92, Standard Test Method for Vickers Hardness of Metallic Materials

ASTM E 94, Standard Guide for Radiographic Examination

ASTM E 110, Standard Test Method for Indentation Hardness of Metallic Materials by Portable Hardness Testers

ASTM E 114, Standard Practice for Ultrasonic Pulse-Echo Straight-Beam Examination by the Contact Method

ASTM E 165, Standard Test Method for Liquid Penetrant Examination

ASTM E 213, Standard Practice for Ultrasonic Examination of Metal Pipe and Tubing

ASTM E 273, Standard Practice for Ultrasonic Examination of the Weld Zone of Welded Pipe and Tubing

ASTM E 309, Standard Practice for Eddy-Current Examination of Steel Tubular Products Using Magnetic Saturation

ASTM E 570, Standard Practice for Flux Leakage Examination of Ferromagnetic Steel Tubular Products

ASTM E 709, Standard Guide for Magnetic Particle Examination

ASTM E 747-04, Standard Practice for Design, Manufacture and Material Grouping Classification of Wire Image Quality Indicators (IQI) Used for Radiology

ASTM E 1290, Standard Test Method for Crack-Tip Opening Displacement (CTOD) Fracture Toughness Measurement

ASTM E 1806 Standard Practice for Sampling Steel and Iron for Determination of Chemical Composition ASTM E 1815-06, Standard Test Method for Classification of Film Systems for Industrial Radiography

ASTM G 39, Standard Practice for Preparation and Use of Bent-Beam Stress-Corrosion Test Specimens

NACE TM0177:2005[5], Laboratory Testing of Metals for Resistance to Sulfide Stress Cracking and Stress Corrosion Cracking in H2S Environments

NOTE: GB/T 4157-2006 is modified in relation to NACE TM0177:1996

NACE TM0284:2003, Standard Test Method - Evaluation of Pipeline and Pressure Vessel Steels for Resistance to Hydrogen-Induced Cracking

NOTE: GB/T 8650-2003 is modified in relation to NACE TM0284:2003.

4 Terms and Definitions

GB/T 15574 or ASTM A941 (relevant steel products), ISO 4885 or ASTM A941 (relevant heat treatment), GB/T 2975, GB/T 17505, GB/T 18253 or ASTM A370 (relevant types of sampling procedures, inspection and inspection documents) defined and the following terms and definitions shall apply.

4.1 As agreed

Requirement to be as agreed upon by the manufacturer and the purchaser, and specified in the purchase order.

NOTE: Associated, for example, with items covered by 7.2 a).

4.2 As-rolled

Delivery condition without any special rolling and/or heat-treatment.

4.3 Cold-expanded pipe

Pipe that, while at ambient mill temperature, has received a permanent increase in outside diameter or circumference throughout its length, by internal hydrostatic pressure in closed dies or by an internal expanding mechanical device.

4.4 Cold-sized pipe

Pipe that, after forming (including sizing on EW), while at ambient mill temperature, has received a permanent increase in outside diameter or circumference for all or part of its length, or permanent decrease in outside diameter or circumference for all or part of its length.

4.5 Cold finishing

[5] NACE International (NACE), P.O. Box 201009, Houston, Texas 77216-1009, USA

Annex M

(Informative)

Correspondence of Terminology Between GB/T 9711 (ISO 3183) and Its Source Documents

The correspondence between the terminology used in this edition of GB/T 9711 (ISO 3183) and the terminology used in GB/T 9711.1 (ISO 3183-1 [15]), GB/T 9711.2 (ISO 3183-2 [16]), GB/T 9711.3 (ISO 3183-3 [17]) and API Spec 5L, 43rd Edition [18] is given in Table M.1.

Table M.1 - Correspondence of terminology between GB/T 9711 (ISO 3183) and its source documents

Document	PSL	Service	GB/T 9711-2011
GB/T 9711.1 (ISO 3183-1 [15])	not applicable	gas or liquid	PSL 1
GB/T 9711.2 (ISO 3183-2 [16])	not applicable	gas or liquid	PSL 2
		gas, where ductile propagating fracture is a	PSL 2 + Annex G, using approach 1
GB/T 9711.3 (ISO 3183-3 [17])	not applicable	sour service	PSL 2 + Annex H
		offshore service	PSL 2 + Annex J
		arctic service	PSL 2, with an appropriately low temperature specified for CVN and/or DWT testing
API Spec 5L, 43rd Edition	PSL 1	gas or liquid	PSL 1
	PSL 2		PSL 2
	PSL 2 + SR5A		PSL 2 + option in 7.2 c) 9)
	PSL 2 + SR5B		PSL 2
	PSL 2 + SR6		PSL 2 + option in 7.2 c) 11)
	PSL 1 or 2 + SR7		PSL 1 or 2 + Annex I
	PSL 2 + SR19		PSL 2 + Annex G, using approach 4

Bibliography

[1] ASTM E29-04, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications [1)]

[2] ISO/TS 29001, Petroleum, petrochemical and natural gas industries - Sector-specific quality management systems - Requirements for product and service supply organizations

[3] ISO 11961, Petroleum and natural gas industries - Steel pipes for use as drill pipe - Specification

[4] ISO 11960, Petroleum and natural gas industries - Steel pipes for use as casing or tubing for wells

[5] ISO 4200, Plain end steel tubes, welded and seamless - General tables of dimensions and masses per unit length

[6] ASME B36.10M, Welded and Seamless Wrought Steel Pipe [2)]

[7] ISO 6761, Steel tubes - Preparation of ends of tubes and fittings for welding

[8] RE, G., PISTONE, G., VOGT, G., DEMOFONTI, G. and JONES, G.G. EPRG recommendation for crack arrest toughness in gas transmission pipelines - 3R international 10-11/1995, pp. 607-611 [3)]

[9] DAWSON, J. and PISTONE, G. Probabilistic evaluation of the safety embodied in the EPRG recommendations for shear arrest toughness - 3R international, 10-11/1998, pp. 728-733 [3)]

[10] EIBER, R.J., BUBENIK, T.A. and MAXEY, W.A. Fracture Control Technology for Natural Gas Pipelines, NG-18 Report No:208, PR-3-9113, December 1993 [4)]

[11] EIBER, R.J., LEIS, B., CARLSON, L., HORNER, N. and GILROY-SCOTT, A. Full Scale Tests Confirm Pipe Toughness for North American Pipeline, Oil & Gas Journal, 97 (45), Nov. 8, 1999

[12] Running shear fracture in line pipe; Subcommittee Summary Report - AISI Committee of Large Diameter Line Pipe Producers; September 1, 1974 [5)]

[13] EFC Publication 16, Guidelines on materials requirements for carbon and low alloy steels for H_2S-containing environments in oil and gas production [6)]

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1 ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA.

2 American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990, USA.

3 EPRG c/o Salzgitter Mannesmann Forschung, GmbH, Ehinger Strasse 200, 47259 Duisburg, Germany.

4 Pipeline Research Council International, 1401 Wilson Boulevard, Site 1101, Arlington, VA 22209, USA. www.prci.com

5 American Iron & Steel Institute, 600 Anderson Drive, Pittsburgh, PA 15220, USA.

6 Maney Publishing, Hudson Road, Leeds LS9 7DL, UK and 1 Carlton House Terrace, London SW1Y 5DB, UK. www.maney@maney.co.uk

[14] DNV-OS-F101, Submarine Pipeline Systems [7)]

[15] ISO 3183-1, Petroleum and natural gas industries - Steel pipe for pipelines - Technical delivery conditions - Part 1: Pipes of requirement class A

[16] ISO 3183-2, Petroleum and natural gas industries - Steel pipe for pipelines - Technical delivery conditions - Part 2: Pipes of requirement class B

[17] ISO 3183-3, Petroleum and natural gas industries - Steel pipe for pipelines - Technical delivery conditions - Part 3: Pipes of requirement class C

[18] API Specification 5L, 43rd Edition, March 2004, Specification for Line Pipe [8)]

[19] API RP 5L1, Railroad Transportation of Line Pipe

[20] API RP 5LW, Recommended Practice for Transportation of Line Pipe on Barges and Marine Vessels

[21] NACE MR0175/ISO 15156-1, Petroleum and Natural Gas Industries - Materials for Use in H2S- Containing Environments in Oil and Gas Production - Part 1: General Principles for Selection of Cracking-Resistant Materials

[22] API Spec 5CT, Specification for Casing and Tubing

[23] EN 10027-2, Designation systems for steels - Part 2: Numerical system

[24] ISO 15614-1, Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys

[25] EN 287-1 [9)], Approval testing of welders - Fusion welding - Part 1: Steels

[26] ISO 9606-1, Approval testing of welders - Fusion Welding - Part 1: Steels

[27] ASME Section IX[10)], ASME Boiler and Pressure Vessel Code - Section IX: Welding and Brazing Qualifications

_____ END _____

7 Det Norske Veritas A.S., Veritasveien 1, N-1322 Høvik, Norway. www.dnv.com

8 American Petroleum Institute, 1220 L Street, N.W., Washington, DC 20005, USA.

9 CEN, European Committee for Standardization, Central Secretariat, Rue de Stassart 36, B-1050, Brussels, Belgium.

10 American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990, USA.

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