SLOVENSKI STANDARD
oSIST prEN ISO 11960:2018

01-september-2018

Industrija nafte in zemeljskega plina - Jeklene cevi, ki se uporabljajo kot zaščitne cevi ali cevovodi za vrtine (ISO/DIS 11960:2018)

Petroleum and natural gas industries - Steel pipes for use as casing or tubing for wells (ISO/DIS 11960:2018)

Erdöl- und Erdgasindustrie - Stahlrohre zur Verwendung als Futter - oder Steigrohre für Bohrungen (ISO/DIS 11960:2018)

Industries du pétrole et du gaz naturel - Tubes d'acier utilisés comme cuvelage ou tubes de production dans les puits (ISO/DIS 11960:2018)

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75.180.10	Oprema za raziskovanje, vrtanje in odkopavanje	Exploratory, drilling and extraction equipment
77.140.75	Jeklene cevi in cevni profili za posebne namene	Steel pipes and tubes for specific use

oSIST prEN ISO 11960:2018 **en,fr,de**

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Petroleum and natural gas industries — Steel pipes for use as casing or tubing for wells

Industries du pétrole et du gaz naturel — Tubes d'acier utilisés comme cuvelage ou tubes de production dans les puits

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 67, *Materials, equipment and offshore structures for petroleum and petrochemical and natural gas industries*, Subcommittee SC 5, *Casing, tubing and drill pipe*.

This sixth edition cancels and replaces the fifth edition (ISO 11960:2014).

It is the intention of ISO/TC 67 that either this edition or the previous edition of ISO 11960 be applicable, at the option of the purchaser (as defined in 4.1.39), for a period of six months from the first day of the calendar quarter immediately following the date of publication of this edition, after which period the previous edition will no longer be applicable.

Introduction

Users of this International Standard are advised that further or differing requirements can be needed for individual applications. This International Standard is not intended to inhibit a vendor from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This can be particularly applicable where there is innovative or developing technology. Where an alternative is offered, it is advisable that the vendor identify any variations from this International Standard and provide details.

This International Standard includes requirements of various nature. These are identified by the use of certain verbal forms:

— SHALL is used to indicate that a provision is MANDATORY;

— SHOULD is used to indicate that a provision is not mandatory, but RECOMMENDED as good practice;

— MAY is used to indicate that a provision is OPTIONAL.

While efforts have been made to ensure the accuracy of the changes indicated, the user of this International Standard is advised to consider the total technical content and not only the changes identified. *The user is ultimately responsible for recognising any differences between this edition and the previous edition of this International Standard. ISO expressly disclaims any liability or responsibility for loss or damage resulting from inappropriate use of this International Standard on the basis of any inaccuracy in the changes identified.*

Petroleum and natural gas industries — Steel pipes for use as casing or tubing for wells

1 Scope

1.1 This International Standard specifies the technical delivery conditions for steel pipes (casing, tubing and pup joints), coupling stock, coupling material and accessory material.

For pipes covered by this International Standard, the sizes, masses and wall thicknesses, as well as, grades and applicable end-finishes are listed in Tables C.1 and C.2 and Tables E.1 and E.2.

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

API Spec 5L pipe may be ordered as casing in accordance with API RP 5C6.

This International Standard is applicable to the following connections in accordance with API Spec 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 International Standard specifies the technical delivery conditions for couplings and thread protection. Supplementary requirements that can optionally be agreed for enhanced leak resistance connections (LC) are given in A.9 SR22.

This International Standard can also be applied to tubulars with connections not covered by ISO/API standards.

1.2 The products to which this International Standard is applicable include the following grades of pipe: H40, J55, K55, N80, L80, C90, R95, T95, P110, C110 and Q125.

1.3 Casing sizes larger than Label 1: 4-1/2 but smaller than Label 1: 10-3/4 can be specified by the purchaser to be used in tubing service, see Tables C.1, C.23, C.27 and C.28 or Tables E.1, E.23, E.27 and E.28.

1.4 Supplementary requirements that can optionally be agreed between purchaser and manufacturer for non-destructive examination, fully machined coupling blanks, upset casing, electric-welded casing, tubing and pup joints, impact testing, seal ring couplings,enhanced leak resistance, tensile testing, sulfide stress cracking testing, yield strength, hardenability and hardness testing are given in Annex A.

1.5 This International 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 Spec 5B.

2 Conformance

2.1 Dual referencing of normative references

In the interests of world-wide application of this International Standard, ISO/TC 67 has decided, after detailed technical analysis, that certain normative documents listed in Clause 3 and prepared by ISO/TC 67 or other ISO Technical Committee are interchangeable in the context of the relevant requirement with the relevant document prepared by the American Petroleum Institute (API), the American Society for Testing and Materials (ASTM) or the American National Standards Institute (ANSI). These latter documents are cited in the running text following the ISO reference and preceded by “or”, for example “ISO XXXX or API YYYY”. Application of an alternative normative document cited in this manner will lead to technical results different from the use of the preceding ISO reference. However, both results are acceptable and these documents are thus considered interchangeable in practice.

2.2 Units of measurement

In this International Standard, data are expressed in both the International System (SI) of units and the United States Customary (USC) system of units. For a specific order item, it is intended that only one system of units be used, without combining data expressed in the other system.

Products manufactured to specifications expressed in either of these unit systems shall be considered equivalent and totally interchangeable. Consequently, compliance with the requirements of this International Standard as expressed in one system provides compliance with requirements expressed in the other system.

For data expressed in the SI, a comma is used as the decimal separator and a space as the thousands separator. For data expressed in the USC system, a dot (on the line) is used as the decimal separator and a space as the thousands separator.

In the text, data in SI units are followed by data in USC units in parentheses.

Separate tables for data expressed in SI units and USC units are given in Annex C and Annex E respectively.

Figures are contained in Annex D and express data in both SI and USC units.

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.

ISO 80000-1, *Quantities and units — Part 1: General*

ISO 643, *Steels — Micrographic determination of the apparent grain size*

ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method*

ISO 6506-2, *Metallic materials — Brinell hardness test — Part 2: Verification and calibration of testing machines*

ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T)*

ISO 6508-2, *Metallic materials — Rockwell hardness test — Part 2: Verification and calibration of testing machines and indenters)*

ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

ISO 7500-1, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system*

ISO 8501-1, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings*

ISO 9513, *Metallic materials — Calibration of extensometer systems used in uniaxial testing*

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

ISO/TR 10400, *Petroleum and natural gas industries — Formulae and calculations for casing, tubing, drill pipe and line pipe*

ISO 10893-2, *Non-destructive testing of steel tubes — Part 2: Automated eddy current testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of imperfections*

ISO 10893-3, *Non-destructive testing of steel tubes — Part 3: Automated full peripheral flux leakage testing of seamless and welded (except submerged arc-welded) ferromagnetic steel tubes for the detection of longitudinal and/or transversal imperfections*

ISO 10893-5, *Non-destructive testing of steel tubes — Part 5: Magnetic particle inspection of seamless and welded ferromagnetic steel tubes for the detection of surface imperfections*

ISO 10893-10, *Non-destructive testing of steel tubes — Part 10: Automated full peripheral ultrasonic testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of longitudinal and/or transverse imperfections*

ISO 10893-11, *Non-destructive testing of steel tubes — Part 11: Automatic ultrasonic testing of the weld seam of welded steel tubes for the detection of longitudinal and/or transverse imperfections*

ISO 11484, *Steel products — Employer's qualification system for non-destructive testing (NDT) personnel*

ISO 13678, *Petroleum and natural gas industries — Evaluation and testing of thread compounds for use with casing, tubing, line pipe and drill stem elements*

ISO 15156-2, *Petroleum and natural gas industries — Materials for use in H_2S-containing environments in oil and gas production — Part 2: Cracking-resistant carbon and low-alloy steels, and the use of cast irons*

ISO/IEC 17011, *Conformity assessment — General requirements for accreditation bodies accrediting conformity assessment bodies*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ANSI/NACE TM0177-2016, *Laboratory Testing of Metals for Resistance to Sulfide Stress Cracking and Stress Corrosion Cracking in H_2S Environments*

ANSI/NACE MR0175/ISO 15156, *Petroleum and natural gas industries — Materials for use in H_2S-containing environments in oil and gas production*

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

API TR 5C3, *Technical Report on Equations and Calculations for Casing, Tubing, and Line Pipe Used as Casing or Tubing; and Performance Properties Tables for Casing and Tubing*

API Spec 5B, *Specification for Threading, Gauging and Thread Inspection of Casing, Tubing, and Line Pipe Threads*

API RP 5C6, Welding Connections to Pipe

ASNT SNT-TC-1A, *Recommended Practice No. SNT-TC-1A — Non-Destructive Testing*

ASTM A370, *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*

ASTM A751, *Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products*

ASTM A941, *Standard Terminology Relating to Steel, Stainless Steel, Related Alloys and Ferroalloys*

ASTM B117, *Standard Practice for Operating Salt Spray (Fog) Apparatus*

ASTM E4, *Standard Practices for Force Verification of Testing Machines*

ASTM E10, *Standard Test Method for Brinell Hardness of Metallic Materials*

ASTM E18, *Standard Test Methods for Rockwell Hardness of Metallic Materials*

ASTM E23, *Standard Test Methods for Notched Bar Impact Testing of Metallic Materials*

ASTM E29, *Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications*

ASTM E83, *Standard Practice for Verification and Classification of Extensometer Systems*

ASTM E112, *Standard Test Methods for Determining Average Grain Size*

ASTM E213, *Standard Practice for Ultrasonic Testing of Metal Pipe and Tubing*

ASTM E273, *Standard Practice for Ultrasonic Testing of the Weld Zone of Welded Pipe and Tubing*

ASTM E309, *Standard Practice for Eddy-Current Examination of Steel Tubular Products Using Magnetic Saturation*

ASTM E543, *Standard Specification for Agencies Performing Nondestructive Testing*

ASTM E570, *Standard Practice for Flux Leakage Examination of Ferromagnetic Steel Tubular Products*

ASTM E709, *Standard Guide for Magnetic Particle Testing*

IADC/SPE 11396, *B.A. Dale, M.C. Moyer, T.W. Sampson, A Test Program for the Evaluation of Oilfield Thread Protectors, IADC/SPE Drilling Conference, New Orleans, LA, 20-23 February 1983*

MIL-STD-810c, *Military Standard: Environmental Test Methods, 10 March 1975*

4 Terms, definitions, symbols and abbreviated terms

4.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ASTM A941 for heat treatment operations and the following apply.

4.1.1
accessory material
seamless casing or tubing, or seamless thick-walled tubes or mechanical tubes, or bar stock or hot forgings used for the manufacture of accessories

4.1.2
API threads
threads as specified in API Spec 5B

4.1.3
arc burn
localised point of surface melting caused by arcing between an electrode or ground (earth) and the product surface

Note 1 to entry: Contact marks, which are intermittent marks adjacent to the weld line of EW pipe resulting from electrical contact between the electrodes supplying the welding current and the pipe surface, or contact marks resulting from the use of a spectrometer for the detection of steel chemical composition, are not arc burns.

4.1.4
carload
quantity of product loaded on a railway car for shipment from the product-making facilities

4.1.5
casing
pipe run from the surface and intended to line the walls of a drilled well

4.1.6
connection
threaded assembly of tubular components

4.1.7
controlled cooling
cooling from an elevated temperature in a pre-determined manner to avoid hardening, cracking or internal damage, or to produce a desired microstructure or mechanical properties

4.1.8
coupling
internally threaded cylinder for joining two lengths of threaded pipe

4.1.9
coupling blank
unthreaded material used to produce an individual coupling

4.1.10
coupling material
thick-walled seamless tube used to manufacture coupling blanks

Note 1 to entry: The main difference between coupling material and coupling stock is that coupling material has no mandatory NDE inspection requirements (see 10.15). See Clause 9 for mandatory NDE requirements for finished couplings.

4.1.11
coupling stock
coupling material that meets the coupling stock requirements

4.1.12
defect
imperfection of sufficient magnitude to warrant rejection of the product based on criteria defined in this International Standard

4.1.13
electric-welded pipe
pipe having one longitudinal seam formed by electric-resistance or electric-induction welding, without the addition of filler metal, wherein the edges to be welded are mechanically pressed together and the heat for welding is generated by the resistance to flow of electric current

4.1.14
full-body
complete cross-section of the product

4.1.15
full-length
complete length of the product (end-to-end)

4.1.16
handling tight
sufficiently tight that the coupling cannot be removed except by the use of a wrench

4.1.17
heat
metal produced by a single cycle of a batch melting process

4.1.18
heat analysis
chemical analysis representative of a heat as reported by the metal producer

4.1.19
imperfection
discontinuity in the product wall or on the product surface that can be detected by a NDE method included in Table C.42 or Table E.42 of this International Standard

4.1.20
inspection
process of measuring, examining, testing, gauging or otherwise comparing a unit of product with the applicable requirements

4.1.21
inspection lot
lot
definite quantity of product manufactured under conditions that are considered uniform for the attribute to be inspected

4.1.22
inspection lot sample
one or more units of product selected from an inspection lot to represent that inspection lot

4.1.23
inspection lot size
number of units of product in an inspection lot

4.1.24
interrupted quenching
quenching in which the product being quenched is removed from the quenching medium while the product is at a temperature substantially higher than that of the quenching medium

4.1.25
label 1
dimensionless designation for the size or specified outside diameter that may be used when ordering pipe

4.1.26
label 2
dimensionless designation for the mass per unit length that may be used when ordering pipe

4.1.27
length
piece of pipe that may be plain-end, threaded, or threaded and coupled, that is in accordance with the length requirements in Clause 8.6, Table C.27 or Table E.27 of this International Standard

4.1.28
linear imperfection
imperfection which includes, but is not limited to, seams, laps, cracks, plug scores, cuts and gouges

NOTE See API Std 5T1.

4.1.29
manufacturer
one or more of the following, depending on the context: pipe mill; processor; threader; coupling manufacturer, pup-joint manufacturer; accessory manufacturer

NOTE See Clause 14.

4.1.30
non-linear imperfection
imperfection which includes, but is not limited to, pits and round-bottom die stamping

Note 1 to entry: See API Std 5T1.

4.1.31
pipe
casing, tubing and pup joints as a group

4.1.32
pipe mill
firm, company or corporation that operates pipe-making facilities

4.1.33
plain-end pipe
pipe, either upset or non-upset, furnished without threads

4.1.34
processor
firm, company or corporation that operates facilities capable of heat-treating products made by a pipe mill

4.1.35
product
pipe, coupling, coupling stock, coupling material, coupling blank or accessory material, either individually or collectively as applicable

4.1.36
product test block
test block removed from the product, the tensile test specimen or through-wall hardness test ring

4.1.37
pup joint
casing or tubing of length shorter than Range 1

Note 1 to entry: See Table C.27 or Table E.27.

4.1.38
pup-joint material
casing or tubing, or thick-wall tubes or mechanical tubes, or bar stock used for the manufacture of pup joints