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Petroleum and natural gas industries — Steel drill pipe

Industries du pétrole et du gaz naturel — Tiges de forage en acier

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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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 5, *Casing, tubing and drill pipe*.

This third edition cancels and replaces the second edition (ISO 11961:2008), which has been technically revised. It also incorporates the Technical Corrigendum ISO 11961:2008/Cor.1:2009.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

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

Petroleum and natural gas industries — Steel drill pipe

1 Scope

This document specifies the technical delivery conditions for steel drill-pipes with upset pipe-body ends and weld-on tool joints for use in drilling and production operations in petroleum and natural gas industries for three product specification levels (PSL-1, PSL-2 and PSL-3). The requirements for PSL-1 form the basis of this document. The requirements that define different levels of standard technical requirements for PSL-2 and PSL-3 are in Annex G.

This document covers the following grades of drill-pipe:

— grade E drill-pipe;

— high-strength grades of drill-pipe, grades X, G and S;

— enhanced H_2S resistance drill pipe, grades D and F.

A typical drill-pipe configuration is given, showing main elements and lengths (see Figure B.1). The main dimensions and masses of the grades of drill-pipe are given in both SI units (see Table A.1) and in USC units (see Table C.1).

This document can also be used for drill-pipe with tool joints not specified by ISO or API standards.

By agreement between purchaser and manufacturer, this document can also be applied to other drill-pipe body and/or tool-joint dimensions. This document lists supplementary requirements that can optionally be agreed between purchaser and manufacturer, for testing, performance verification and non-destructive examination (see Annex E).

This document does not consider performance properties, nor performance degradation of the product when in service.

NOTE 1 In this document, drill-pipe is designated by label 1, label 2, grade of material (E, X, G, S, D and F), upset type and type of rotary shouldered connection. Designations are used for the purpose of identification in ordering.

NOTE 2 Reference can be made to ISO 10424-2 or API Spec 7-2 for the detailed requirements for the threading of drill-pipe tool joints.

NOTE 3 Reference can be made to API RP 7G for the performance properties of the drill-pipe.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method*

ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method*

ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method*

ISO 6892, *Metallic materials — Tensile testing*

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

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

ISO 10424-2, *Petroleum and natural gas industries — Rotary drilling equipment — Part 2: Threading and gauging of rotary shouldered thread connections*

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

Spec API 7-2, *Specification for Threading and Gauging of Rotary Shouldered Thread Connections*

ANSI/NACE TM0177, *Laboratory testing of metals for Resistance to Sulfide Stress Cracking and Stress Corrosion Cracking in H_2S Environments*

ASME. *Boiler and Pressure Vessel Code, Section IX*

ASNT SNT-TC-1A, *Recommended Practice, Personnel Qualification and Certification in 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, *Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys*

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

ASTM E92, *Standard Test Method for Vickers Hardness of Metallic Materials*

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

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

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

ASTM E709, *Standard Guide for Magnetic Particle Testing*

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1.1
bevel diameter
outer diameter of the sealing shoulder of a rotary shouldered connection

3.1.2
defect
imperfection of sufficient magnitude to warrant rejection of the product based on criteria defined in this document

[SOURCE: ISO 11960:2014, definition 4.1.12]

3.1.3
drill-pipe
drill-pipe body with weld-on tool joints

3.1.4
drill-pipe body
seamless pipe with upset ends

Note 1 to entry: See Figure B.1.

3.1.5
drill-pipe-body manufacturer
firm, company or corporation that operates facilities for making drill-pipe bodies and is responsible for compliance with the requirements of this document applicable to the drill-pipe body

Note 1 to entry: See 7.21.

3.1.6
drill-pipe manufacturer
firm, company or corporation responsible for compliance with all the applicable requirements of this document

Note 1 to entry: See 6.16.

3.1.7
drill-pipe torsion-strength ratio
torsion strength of the tool-joint connection divided by the drill-pipe-body torsion strength

3.1.8
drill-pipe weld neck
machined part of the drill-pipe comprising the tool-joint weld neck, the weld and the drill-pipe-body upset

Note 1 to entry: See Figure B.1.

3.1.9
elephant hide
wrinkled outside diameter surfaces of the drill-pipe body caused by the upsetting process

3.1.10
enhanced H_2S resistance
classification of drill pipe that includes Sulfide Stress Cracking testing as part of its qualification and quality control

3.1.11
essential variable
variable parameter in which a change affects the mechanical properties of the weld joint

3.1.12
gouge
elongated groove or cavity caused by mechanical removal of metal

3.1.13
hard banding
application of material onto tool joints to reduce external wear of the tool joint

Note 1 to entry: This is also known as hard facing.

3.1.14
hardness number
result from a single hardness impression

3.1.15
heat
heat of steel
metal produced by a single cycle of a batch-melting process

3.1.16
heat analysis
chemical analysis representative of a heat as reported by the metal producer

[SOURCE: ISO 11960:2014, definition 4.1.18]

3.1.17
imperfection
discontinuity in the product wall or on the product surface that can be detected by an NDE method included in this document

[SOURCE: ISO 11960:2014, definition 4.1.19, modified]

3.1.18
indication
evidence of a discontinuity that requires interpretation to determine its significance

3.1.19
inspection
process of measuring, examining, testing, gauging or otherwise comparing the product with the applicable requirements

3.1.20
label 1
dimensionless designation for the drill-pipe-body size that may be used when ordering

3.1.21
label 2
dimensionless designation for the drill-pipe-body mass per unit length that may be used when ordering

3.1.22
linear imperfection
imperfection that includes, but is not limited to, seams, laps, cracks, plug scores, cuts, gouges and elephant hide

Note 1 to entry: See API 5T1.

[SOURCE: ISO 11960:2004, definition 4.1.28, modified]