INTERNATIONAL STANDARD

ISO 10407-2

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Petroleum and natural gas industries — Rotary drilling equipment —

Part 2: Inspection and classification of used drill stem elements

Industries du pétrole et du gaz naturel — Équipement de forage rotatif —
Partie 2: Contrôle et classification des éléments de garnitures de forage usagés

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 10407-2 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 4, *Drilling and production equipment*.

This first edition of ISO 10407-2, together with ISO 10407-1, replaces ISO 10407:1993, which will be cancelled when both ISO 10407-1 and ISO 10407-2 have been published and which has been technically revised.

ISO 10407 consists of the following parts, under the general title *Petroleum and natural gas industries — Rotary drilling equipment*:

— *Part 2: Inspection and classification of used drill stem elements*

A Part 1, dealing with drill stem design and operating limits, is under development.

Introduction

Users of this International Standard should be aware 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, the vendor should identify any variations from this International Standard and provide details.

This International Standard shall become effective on the date printed on the cover but may be used voluntarily from the date of distribution.

This International Standard includes provisions of various natures. 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;

— CAN is used to indicate a POSSIBILITY.

Petroleum and natural gas industries — Rotary drilling equipment —

Part 2: Inspection and classification of used drill stem elements

1 Scope

This part of ISO 10407 specifies the required inspection for each level of inspection (Tables B.1 through B.15) and procedures for the inspection and testing of used drill stem elements. For the purpose of this part of ISO 10407, drill stem elements include drill pipe body, tool joints, rotary-shouldered connections, drill collar, HWDP and the ends of drill stem elements that make up with them. This part of ISO 10407 has been prepared to address the practices and technology commonly used in inspection.

The practices established within this part of ISO 10407 are intended as inspection and/or testing guidance and are not intended to be interpreted to prohibit the agency or owner from using personal judgement, supplementing the inspection with other techniques, extending existing techniques or re-inspecting certain lengths.

This part of ISO 10407 specifies the qualification of inspection personnel, a description of inspection methods and apparatus calibration and standardization procedures for various inspection methods. The evaluation of imperfections and the marking of inspected drill stem elements is included.

This part of ISO 10407 provides the original equipment manufacturers' requirements regarding the minimum information needed for the inspection of their specialized tools in Annex A.

2 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 10424-1, *Petroleum and natural gas industries — Rotary drilling equipment — Part 1: Rotary drill stem elements*

ISO 11961[4)], *Petroleum and natural gas industries — Steel drill pipe*

API RP 7A1, *Testing of Thread Compound for Rotary Shouldered Connections*

4) To be published. (Revision of ISO 11961:1996, *Petroleum and natural gas industries — Steel pipes for use as drill pipe — Specification*)

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
agency
entity contracted to inspect used drill stem elements using the methods and criteria specified

3.2
A-scan
ultrasonic instrument display where distance is represented on the horizontal axis and signal strength on the vertical axis

3.3
bending-strength ratio
BSR
ratio of the section modulus of the box thread at its last engaged thread to the pin thread at its last engaged thread

3.4
bevel diameter
outer diameter of the contact face of the rotary shouldered connection

3.5
bit sub
sub, usually with two box connections, that is used to connect the bit to the drill stem

3.6
bottleneck sub
sub with two distinct outside diameters

3.7
box end
end of pipe with internal threads

3.8
box thread
internal (female) threads of a rotary shouldered connection

3.9
class 2
second in the hierarchy of used drill pipe service classifications for used drill pipe that does not meet premium class requirements

3.10
class 3
third in the hierarchy of used drill pipe service classifications for used drill pipe that does not meet class 2 requirements

3.11
calibration
adjustment of instruments to a known basic reference often traceable to the national standards body

NOTE Calibration typically is documented in a log book and by a tag applied to the instrument.

3.12
check
go/no-go determination that dimension is within tolerances

3.13
corrosion
alteration and degradation of material by its environment

3.14
critical area
area from the base of the tapered shoulder of the tool joint to a plane located 660 mm (26.0 in) away, or the end of the slip marks, whichever distance is greater

See Figure 4.

NOTE When applied to the work-string tubing area, it is from the end of the pipe to a plane located 508 mm (20 in) away, or the end of the slip marks, whichever distance is greater.

3.15
cut
incision without removal of metal caused by a sharp object

3.16
dent
local change in surface contour caused by mechanical impact, but not accompanied by loss of metal

3.17
drift
cylindrical gauge used to check the minimum inside diameter

3.18
drill collar
thick-walled pipe or tube designed to provide stiffness and concentration of mass at or near the bit

3.19
drill pipe
drill pipe body with weld-on tool joints

See Figure 1.

3.20
drill-pipe body
seamless steel pipe with upset ends

See Figure 1.

3.21
drill stem
all members between the swivel or top drive and the bit; includes drill string

3.22
drill string
several sections or joints of drill pipe with the tool joints that are joined together

3.23
failure
improper performance of a device or equipment that prevents completion of its design function

3.24
fatigue
process of progressive localized permanent structural change occurring in a material subjected to conditions that produce fluctuating stresses and strains at some point or points and that can culminate in cracks or complete fracture after a sufficient number of fluctuations

3.25
fatigue failure
failure that originates as a result of repeated or fluctuating stresses having maximum values less than the tensile strength of the material

3.26
fatigue crack
crack resulting from fatigue

3.27
filtered FWAC
full-wave current rectified by passing it through a capacitor or other electrical device to remove the fluctuations associated with alternating current

3.28
fish neck
region with a reduced diameter at or near the upper end of a drill string member which fishing tools can grab

3.29
full-depth thread
thread for which the thread root lies on the minor cone of an external thread or lies on the major cone of an internal thread

3.30
gall
surface damage on threads and seals caused by localized friction

3.31
gouge
elongated grooves or cavities caused by mechanical removal of metal

3.32
grind, noun
area where metal was removed with an abrasive wheel in the process of evaluation or repair on an imperfection

3.33
hard-banding
hard-facing
sacrificial or wear-resistant material applied to component's surface to prevent wear of the component

3.34
heat checking
formation of surface cracks formed by the rapid heating and cooling of the component

3.35
heavy-weight drill pipe
HWDP
pipe with thick wall used in the transition zone to minimize fatigue and as bit weight in directional wells

3.36
inspection
process of measuring, examining, testing, gauging or otherwise comparing the product with the applicable requirements

3.37
jar
mechanical or hydraulic device used in the drill stem to deliver an impact load to another component of the drill stem, especially when that component is stuck

3.38
kelly
square- or hexagonal-shaped steel pipe connecting the swivel to the drill pipe

NOTE The kelly moves through the rotary table and transmits torque to the drill stem.

3.39
label
dimensionless designation for the pipe body size, pipe body mass per unit length or the size and style of a rotary shouldered connection

3.40
last engaged thread
last thread on the pin engaged with the box or the box engaged with the pin

See Figure 2.

3.41
lead
distance parallel to the thread axis from a point on a thread turn and the nearest corresponding point on the next turn, i.e. the axial displacement of a point following the helix one turn around the thread axis

3.42
lower kelly valve
kelly cock
essentially full-opening valve installed immediately below the kelly, with outside diameter equal to the tool joint outside diameter

NOTE The valve can be closed to remove the kelly under pressure and can be stripped in the hole for snubbing operations.

3.43
make-up shoulder
sealing shoulder on a rotary shouldered connection

3.44
measure
determining of dimensional value and recording of it on a worksheet

3.45
mill slot
flat machined area on the outside diameter of a tool joint where grade, weight code and optional serial number information is stamped

3.46
owner
company or person who specifies the type of inspection or testing to be conducted and who has the authority to order it performed

3.47
pi tape
flexible steel tape that, when wrapped around the circumference of a cylinder, indicates the average outside diameter

3.48
pin base
non-threaded area at the large end of the pin connection adjacent to the shoulder

3.49
pin end
end of the pipe with external threads

3.50
pipe body
seamless steel pipe excluding upset and upset-affected areas

See Figure 1.

3.51
pit
depression resulting from corrosion or removal of foreign material rolled into the surface during manufacture

3.52
pitch
axial distance between successive threads

NOTE In a single start thread, pitch is equivalent to lead.

3.53
premium class
highest in the hierarchy of used drill pipe service classifications, better than class 2 and class 3

3.54
quality programme
established documented system for ensuring quality

3.55
rotary shouldered connection
connection used on drill stem elements that have coarse, tapered threads and sealing shoulders

3.56
seamless pipe
wrought steel tubular product made without a weld seam

3.57
slip area
that part of the pipe body where there is visible evidence of the trip slips having been repeatedly set numerous times in the same area

See Figure 4.

NOTE At the upper end, it is typically located approximately 560 mm (22 in) from the box-tool joint elevator shoulder, and extends from that point approximately 660 mm (26 in) toward the pin end. It can be located elsewhere depending on rig design and positioning of handling equipment. It does not include occasional setting of slips in other areas as a result of fishing operations, drill stem tests and similar applications.

3.58
stabilizer
member of the drill stem assembly used to centralize or control the direction of the bottom-hole assembly

3.59
straight sub
sub with no outside diameter change

3.60
standardization
adjustment of instruments prior to use to an arbitrary reference value

3.61
sub
short, threaded piece of pipe used to connect parts for the drilling assembly for various reasons, such as crossing over to a different connection, or to save wear and tear on more expensive elements

3.62
thread form
thread profile in an axial plane for a length of one pitch

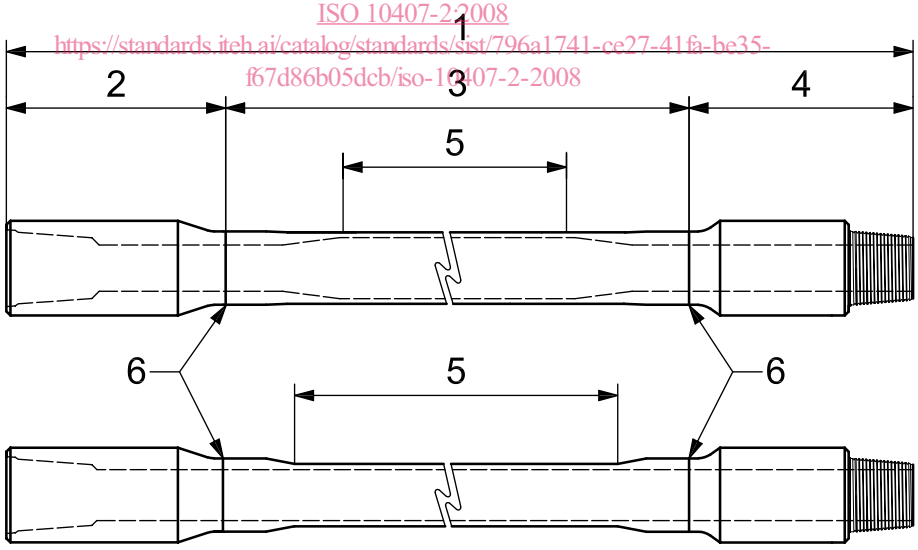
3.63
tolerance
amount of variation permitted

3.64
upper kelly cock
valve immediately above the kelly that can be closed to confine pressure inside the drill stem

3.65
upset
forged end of a drill pipe tube used to increase wall thickness

3.66
user
company or person who employs the equipment

3.67
weight code
unique numerical code for each outside diameter of drill pipe, normally stamped on the pin base and in the mill slot, which provides wall thickness and pipe body mass per unit length information



Key

1	drill pipe	4	tool joint pin
2	tool joint box	5	pipe body
3	drill pipe body	6	weld

Figure 1 — Drill-pipe nomenclature