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Petroleum, petrochemical and natural gas industries — Safety of machineries — Powered elevators

Industries du pétrole, de la pétrochimie et du gaz naturel — Sécurité des machines — Élévateurs motorisés

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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 4, *Drilling and production equipment*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 12, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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

This document is a type-C standard as stated in ISO 12100.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

— machine manufacturers (small, medium and large enterprises);

— health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.)

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

— machine users/employers (small, medium and large enterprises);

— machine users/employees (e.g. trade unions, organizations for people with special needs);

— service providers, e. g. for maintenance (small, medium and large enterprises);

— consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the Scope of this document.

When requirements of this type-C standard are different from those which are stated in type-A or type-B standards, the requirements of this type-C standard take precedence over the requirements of the other standards for machines that have been designed and built according to the requirements of this type-C standard.

Petroleum, petrochemical and natural gas industries — Safety of machineries — Powered elevators

1 Scope

This document specifies general safety requirements for the design, testing and production of powered elevators. The requirements are applicable for onshore and offshore applications of such elevators in the petroleum and petrochemical industries.

This document does not cover any other type of elevator. It is not applicable to the following types of products:

— remote control devices;

— lifting nubbins;

— lifting plugs;

— lifting subs;

— internal gripping devices;

— equipment for lifting tubular from and onto a vessel;

— elevator links or bails.

This list is not exhaustive.

This document is not applicable to powered elevators manufactured before the date of this publication.

NOTE Annex A provides the relation between the clauses of the European Directive on machinery (Directive 2006/42/EC) and this document, for potential significant hazards and the safety requirements dealing with them for powered elevators.

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 3864 (all parts), *Graphical symbols — Safety colours and safety signs*

ISO 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 13849-1, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

ISO 13534, *Petroleum and natural gas industries — Drilling and production equipment — Inspection, maintenance, repair and remanufacture of hoisting equipment*

ISO 13535:2000, *Petroleum and natural gas industries — Drilling and production equipment — Hoisting equipment*

ISO 13850, *Safety of machinery — Emergency stop function — Principles for design*

ISO 13854, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*

ISO 14120, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

ISO 80079-36, *Explosive atmospheres — Part 36: Non-electrical equipment for explosive atmospheres — Basic method and requirements*

ISO 80079-37, *Explosive atmospheres — Part 37: Non-electrical equipment for explosive atmospheres — Non-electrical type of protection constructional safety "c", control of ignition sources "b", liquid immersion "k"*

3 Terms and definitions

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

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

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

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

3.1
control system
system that responds to input signals from parts of the *elevator* (3.5), operators, external control equipment or any combination of these, and generates corresponding output signals to the elevator actuators, causing the elevator to perform in the intended manner

3.2
danger zone
space within, under and/or around machinery in which a person can be exposed to a hazard

[SOURCE: ISO 12100:2010, 3.11]

3.3
design verification
process of examining the result of a given design or development activity to determine conformity with specified requirements

[SOURCE: ISO/TS 29001:2010, 3.1.8]

3.4
DROPS
dropped objects
industry-wide initiative focused on preventing dropped objects

Note 1 to entry: DROPS ultimate goal is delivering a second nature dropped objects prevention strategy across the industry.

3.5
elevator
lifting accessory to be used for lifting and handling of tubular in the on- and offshore drilling industry on or in the vicinity of the drill floor

3.6
fatigue life
number of stress cycles of a specific character that an *elevator* (3.5) sustains before failure of a specified nature occurs

3.7
feedback signal
signal generated by the *elevator* (3.5) that can be used for monitoring or functional use

Note 1 to entry: Examples of feedback signals include elevator set for safe lifting, weight in elevator, and elevator open.

3.8
insert
gripping/holding device, with or without teeth that embed into the side of the tubular, which can create friction in order to suspend the tubular

3.9
interface
connection of the *elevator* (3.5) with the associated external infrastructure and vice versa

Note 1 to entry: The interface can be any transfer of signals or power by means of for example hydraulics, pneumatics, electrics or wireless.

3.10
internal control device
device located on the *elevator* (3.5) itself

Note 1 to entry: Internal control devices are parts of the *control system* (3.1), which detect input signals and/or generate output signals.

3.11
locking
ensuring that the securing is maintained

3.12
movement of the powered elevator
movement of parts of the *elevator* (3.5), excluding movements of the elevator (e.g. generated by the top drive)

3.13
pick up
lifting tubular from a non-vertical (typical near horizontal) position outside the drill floor area into a vertical position in the drill floor area

3.14
powered elevator
lifting accessories to be used for lifting and handling of tubular in the onshore and offshore drilling industry on or in the vicinity of the drill floor, of which the movement of the mechanics is done partly or completely mechanically using a *power source* (3.15)

3.15
power source
engine or motor which provides mechanical energy for linear or rotational movement

[SOURCE: ISO 11449:1994, 3.2]

3.16
primary feedback signal
signal generated by the elevator status that indicates the *elevator* (3.5) is set for safe lifting

3.17
product verification
evaluation of the implementation of the product against the requirements to determine that they have been met

[SOURCE: ISO 16404:2013, 3.3]

3.18
remote control device
device located at a distance from the *elevator* (3.5)

Note 1 to entry: Remote control devices are parts, which detect input signals and/or generate output signals.

3.19
safe lift
lifting of tubular in a safe way, without creating an unacceptable risk for equipment and personnel

Note 1 to entry: Safe lifts are ensured by maintaining sufficient contact between the *elevator* (3.5) and the tubular to be lifted, preventing inadvertent loss of contact and verifying that these conditions are fulfilled.

3.20
safe working load
maximum load that can be handled by the manual *elevator* (3.5) after subtracting the foreseeable dynamic load for the specific application from its rated load

3.21
secondary feedback signal
other signal than *primary feedback signal* (3.16) generated by the elevator status that indicates any other state than readiness for safe lifting (e.g. weight indication)

3.22
securing
fastening of the wrap-around of an *elevator* (3.5) around a tubular

EXAMPLE 1 To latch (completing a circle).

EXAMPLE 2 To set *slips* (3.26).

3.23
service life
expected lifetime, or acceptable period of use in service

Note 1 to entry: Service life is the length of time that the *elevator* (3.5) can be expected to be “serviceable” or to be supported by the manufacturer.

3.24
short ton
ston
unit of weight equal to $9{,}071\ 847 \cdot 10^2$ kg

Note 1 to entry: 1 ton (US) = 1 ston = $9{,}071\ 847 \cdot 10^2$ kg.

3.25
size component
replaceable component which is required in order to handle a specific size and/or type of tubular

3.26
slip
tapered or wedge-shaped *size component* (3.25) used to grip the tubular, and whose exterior is tapered to match the taper of the elevator frame

Note 1 to entry: A slip either has non-replaceable teeth or is fitted with *inserts* (3.8).

3.27
verification
<for safe manual elevator lift> assurance that the *elevator* (3.5) is in the required condition for the action to be performed, for any position or any allowable user situation for which the elevator is designed

3.28
wrapping
closing the elevator around the tubular in order to prepare the elevator for securing

4 Abbreviated terms

ESD	emergency shutdown
HMI	human machine interface
MSDS	material safety data sheet
PL	performance level
SWL	safe working load

5 Safety requirements and/or protective/risk reduction measures

5.1 General requirements for powered elevators

The powered elevator shall comply with ISO 13535 and the additional requirements according to this document. The requirements of this document take precedence over those of ISO 13535.

The powered elevator shall be designed according to the principles of ISO 12100 for relevant but not significant hazards which are not dealt with by this document.

5.2 Mechanical strength

The mechanical strength of the powered elevator shall be in accordance with ISO 13535:2000, Clause 5.

Adequate mechanical design shall be verified by a static test in accordance with ISO 13535:2000 and Annex B.

5.3 Safety design of powered elevators

5.3.1 General

The powered elevator design and product verification shall be carried out in accordance with Annex B.

5.3.2 Ergonomic design

The powered elevator shall allow safe handling of the elevator during all stages of the transport, installation and operation process.

5.3.3 Fastening methods and DROPS prevention of parts

5.3.3.1 Primary-fixing

Primary fixing is the primary method by which an item is fixed to prevent unintentional dropping or falling, e.g. bolted connection/welds.

5.3.3.2 Securing against loosening (secondary retention)

Secondary retention is the method for securing a part from unintended loosening resulting in loss of clamping force and/or pre-tension and/or unscrewing and/or displacement and/or loss of any part.

All parts for which unintended loosening can create a hazard shall be fastened with a method preventing unintended loosening, e.g. by tab-washer, spring washer.

The reliability of the retention method shall be assessed in accordance with ISO 12100.

5.3.3.3 Securing against dropping (DROPS prevention)

Appropriate design measures shall be taken for all parts, which can become a hazardous dropped object in case of component failure.

The reliability of the securing method shall be assessed in accordance with ISO 12100.

The causes of failure taken into account shall include:

a) vibration;

b) improper maintenance;

c) corrosion;

d) shock loading;

e) collision.

The potential for dropped objects/falling objects shall be prevented by measures including but not limited to:

a) design;

b) speciality fasteners;

c) lanyards, cabling or safety wire;

d) guarding.

5.3.4 Suspension points

The powered elevator shall be designed so that it cannot inadvertently disconnect from its suspension points regardless of the angle of rotation relative to the suspension points.

When the powered elevator has secondary suspension points for suspending another elevator underneath, these suspension points shall be tested in accordance with B.2. The rating of each secondary suspension point, determined in accordance with ISO 13535, shall be marked at the suspension point sufficient to indicate the maximum load that can be applied.

5.3.5 Moving parts, pinch points and guards

The powered elevator shall be designed to provide safe operator contact with designated areas for operation. The provisions made shall include at least the following.

a) Dedicated areas for placing hands for operating the elevator shall be coloured green by means of paint, grip points or otherwise.

b) Handles shall be designed so that an operator cannot be injured by other parts of the elevator. If interference is unavoidable, adequate protective measures such as guards shall be provided.

c) When other measures are not practical, warnings shall be displayed near or on identified potentially hazardous pinch points.