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Structures for mine shafts —

Part 7: Rope guides

Structures de puits de mine —

Partie 7: Guides-câbles

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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 82, *Mining*.

A list of all parts in the ISO 19426 series can be found on the ISO website.

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.

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Introduction

Many mining companies, and many of the engineering companies that provide designs for mines, operate globally so ISO 19426 was developed in response to a desire for a unified global approach to the safe and robust design of structures for mine shafts. The characteristics of ore bodies, such as their depth and shape, vary in different areas so different design approaches have been developed and proven with use over time in different countries. Bringing these approaches together in ISO 19426 will facilitate improved safety and operational reliability.

The majority of the material in ISO 19426 deals with the loads to be applied in the design of structures for mine shafts. Some principles for structural design are given, but for the most part it is assumed that local standards will be used for the structural design.

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Structures for mine shafts —

Part 7:
Rope guides

1 Scope

This document specifies the design loads and the design procedures for the design of rope guides and rubbing ropes used for guiding conveyances and preventing collisions in vertical mine shafts for permanent operations. It covers personnel and material hoisting, as well as rock hoisting installations. There are no fundamental limitations placed on the size of conveyances, the hoisting speeds, shaft layout configurations, or the shaft depth.

This document can be applicable to shaft sinking operations when kibbles run on the stage ropes.

There are many reasons, based on technical, timing, and cost factors, why rope guides are selected or not for a particular application, following careful assessment at feasibility stage of any project where rope guides are considered. This document provides some comments regarding the advantages and disadvantages of using rope guides compared to rigid guides, and specific design aspects for consideration when using rope guides. However, it is primarily intended to provide the technical information required to ensure good engineering of shafts where rope guided hoisting is the chosen solution.

This document does not cover matters of operational safety.

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 19426-1, *Structures for mine shafts — Part 1: Vocabulary*

ISO 19426-2, *Structures for mine shafts — Part 2: Headframe structures*

ISO 19426-5, *Structures for mine shafts — Part 5: Shaft system structures*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 19426-1 and the following 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
cheeseweight
stack of weights, usually steel castings, suspended from the bottom of a rope guide forming a dead weight tensioning system

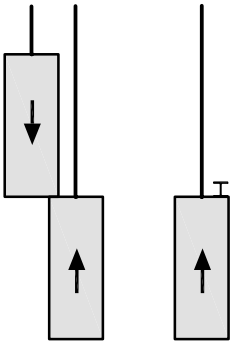
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3.2
direct collision
event in which a conveyance strikes another conveyance or some other surface that is essentially transverse to the direction of travel of the conveyance

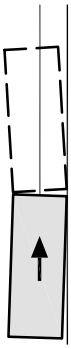
Note 1 to entry: See Figure 1 a).

3.3
oblique collision
event in which a conveyance strikes a shaft side wall or some other surface that is oriented essentially parallel with the direction of travel of the conveyance

Note 1 to entry: See Figure 1 b).



a) Direct collision



b) Oblique collision

Figure 1 — Schematic of possible collision types

3.4
design clearance
static clearance
nominal distance between different conveyances, or between conveyances and fixed objects, in the shaft, as shown on the design drawings

3.5
design location
intended location of elements of the rope guided hoisting installation, as shown on the design drawings

3.6
displacement multiplier
factor by which the predicted conveyance lateral displacement is multiplied to make statistical allowance for inaccuracies in simulation and aerodynamic coefficients and construction tolerances

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3.7
dynamic clearance
minimum distance between different conveyances, or between conveyances and fixed objects, in the shaft during hoisting in the shaft, which is equal to the *design clearance* (3.4) less the maximum *dynamic displacement* (3.8)

3.8
dynamic displacement
lateral displacement of conveyances while travelling in the shaft

3.9
design dynamic displacement
lateral *dynamic displacement* (3.8) of conveyances while travelling in the shaft multiplied by the *displacement multiplier* (3.6), which makes provision for simulation uncertainties and construction inaccuracies

3.10
reduced dynamic clearance
minimum distance between different conveyances, or between conveyances and fixed objects, in the shaft during hoisting in the shaft, which is equal to the *design clearance* (3.4) less the *design dynamic displacement* (3.9)

3.11
entry point
position at which a conveyance enters fixed guides at the top and bottom ends of the hoisting cycle, and at any intermediate stations

3.12
guide block
guide bush
guide slipper
attachment of a conveyance to the rope guides

Note 1 to entry: The guide block is usually made in two halves to bolt around the rope guide, and it has a guide block liner forming the rubbing surface on the rope guide.

3.13
intermediate loading station
loading station between bank level or a tipping station at the top of the shaft and a loading station at the bottom of the shaft, or any loading station located more than 100 m below the top anchor point of the rope guides or more than 100 m above the bottom anchor point of the rope guides

3.15
rope guide shoe
mounting to secure the *guide block* (3.12) through which the rope guide passes to the conveyance

3.16
rubbing block
fixed guide slippers
contact point between a conveyance and the fixed guides at top and bottom of winding cycle, which can run within or outside the fixed guide

Note 1 to entry: Where the fixed guides are located close to the rope guides, the rubbing block can also serve the purpose of the rope guide shoe.

3.17
rubbing rope
rope located between conveyances running on rope guides, intended to deflect conveyances away from each other, thereby reducing the severity of a possible collision

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3.18
vertical shaft cylinder
maximum circular cylinder, clear of any obstructions, that fits within the excavated mine shaft and constructed infrastructure

3.19
winder emergency braking
winder trip-out
braking of the winder under emergency conditions, such as loss of electrical power, detection of over-tension or under-tension on the hoist ropes, or accident to shaft signal

4 Symbols

a	Conveyance acceleration, m/s^2
A_C	Area of the relevant side of a conveyance, m^2
A_R	Cross sectional steel area of a single head rope, m^2
A_1, A_2	Area of specified portions of a shaft cross-section, m^2
b	Thickness of skip stiffeners, m
B_E	Distance between the conveyance centre of gravity and the geometrical centre of the set of rope guides, guiding that conveyance, m
B_X, B_Z	Plan dimensions of a conveyance, m
C_{BX}, C_{BZ}	Basic aerodynamic lateral force coefficient in appropriate direction, taken as 0,018
C_L	Aerodynamic force coefficient
C_{LX}, C_{LZ}	Aerodynamic lateral force coefficient in appropriate direction
C_{LP}	Conveyance passing buffeting force coefficient
C_Q	Torque factor applied to head ropes
C_T	Coefficient of thermal expansion of the rope guide, °C^{-1}
d_S	Shaft diameter, m
d_R	Rope diameter, m (note that this is usually given in mm in hoist rope catalogues)
D_A	Lateral conveyance displacement due to steady state aerodynamic force, m
D_B	Lateral conveyance displacement due to buffeting forces, m
D_C	Lateral conveyance displacement due to Coriolis force, m
D_{EB}	Lateral conveyance displacement at the bottom of the conveyance due to conveyance eccentricity with respect to the head rope attachment point, m
D_{EC}	Lateral conveyance displacement at the centre of gravity of the conveyance due to conveyance eccentricity with respect to the head rope attachment point, m
D_{ET}	Lateral conveyance displacement at the top of the conveyance due to conveyance eccentricity with respect to the head rope attachment point, m
D_G	General lateral displacement of the centre of gravity of a conveyance in a shaft, m

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