INTERNATIONAL STANDARD

ISO 19426-7

First edition
2021-05

Structures for mine shafts —

Part 7: Rope guides

Structures de puits de mine —

Partie 7: Guides-câbles

This document is a preview generated by EVS

Reference number
ISO 19426-7:2021(E)

© ISO 2021

This document is a preview generated by EVS



COPYRIGHT PROTECTED DOCUMENT

© ISO 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Published in Switzerland

Contents

Page

Foreword ..... **v**
Introduction ..... **vi**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Symbols **4**
5 Materials **8**
6 Disturbing actions **8**
6.1 Coriolis force 8
6.2 Aerodynamic loads 9
6.2.1 Steady state 9
6.2.2 Buffeting 9
6.2.3 Air density 10
6.3 Rope torque 10
6.3.1 Head rope torque 10
6.3.2 Tail rope torque 11
6.3.3 Torque applied by multiple ropes 11
6.4 Eccentric conveyance loading 11
6.5 Winder emergency braking 12
6.6 Thermal actions on headframe 12
6.7 Wind load on conveyances 12
7 Restoring forces **12**
7.1 Rope guide tension 12
7.2 Rope guide stiffness 13
7.2.1 Stiffness of rope guides 13
7.2.2 Stiffness of head and tail ropes 13
8 Conveyance trajectory **15**
8.1 Simulation of conveyance behaviour 15
8.2 Combination of actions 15
9 Design procedure **15**
9.1 Function of rope guides 15
9.2 Risk assessment 15
9.3 General design procedure 15
9.4 Simple design procedure 16
9.4.1 Limits on parameters 16
9.4.2 Design requirements 16
9.5 Comprehensive design procedure 16
10 Minimum clearances **17**
10.1 Design clearances 17
10.2 Dynamic displacement envelope 17
10.3 Reduced dynamic clearances 17
10.4 Use of rubbing ropes 18
11 Construction and installation tolerances **18**
11.1 Shaft vertical cylinder diameter 18
11.2 Tolerance of associated structures 18
11.3 Tolerance on rope guide tension 18
11.4 Commissioning 18
11.4.1 Commissioning procedure 18
11.4.2 Components of the commissioning procedure 18

This document is a preview generated by EVS

© ISO 2021 – All rights reserved

12 Other design considerations **19**
12.1 General 19
12.2 Loading and unloading of conveyances 19
12.3 Accessing intermediate levels 19
12.4 Number of rope guides 19
12.5 Rope guide positions 19
12.6 Rope guide construction 19
12.7 Rope guide tension and factor of safety 20
12.8 Rope guide attachments 20
12.9 Shafts with more than one winder 20
12.10 Design life 20
12.11 Rope guide tensioning 20
12.11.1 Gravity tensioning devices 20
12.11.2 Hydraulic tensioning devices 20

13 Assessment of existing installations **21**
13.1 General 21
13.2 Application of measurements 21
13.3 Upgrades or modifications 21

14 Inspection and maintenance **22**
14.1 Deterioration mechanisms 22
14.1.1 General 22
14.1.2 Wear 22
14.1.3 Corrosion 22
14.1.4 Mechanical damage 22
14.1.5 Broken wires 22
14.2 Inspections 22
14.2.1 General 22
14.2.2 Inspection intervals 22
14.2.3 Visual inspection 22
14.2.4 Non-destructive inspection 22
14.3 Maintenance actions 23
14.3.1 Maintenance intervals 23
14.3.2 Lubrication 23
14.3.3 Rope turning and rope lifting 23
14.3.4 Equalisation of hoist rope tensions 23
14.4 Rope guide discard criteria 23
14.5 Rope guide attachments 23

Annex A (informative) **Load combinations and displacement multipliers** **24**

Annex B (informative) **Introduction to Annexes B to F, and basic parameters** **26**

Annex C (informative) **Preliminary aerodynamic coefficients** **35**

Annex D (informative) **Rope torque factors** **44**

Annex E (informative) **Rope guide stiffness and tension** **46**

Annex F (informative) **Approximate calculation of conveyance displacement** **50**

Bibliography **53**

This document is a preview generated by EVS

 © ISO 2021 – All rights reserved

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.

This document is a preview generated by EVS

© ISO 2021 – All rights reserved

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.

This document is a preview generated by EVS

© ISO 2021 – All rights reserved

Structures for mine shafts —

Part 7:
Rope guides

This document is a preview generated by EVS

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

© ISO 2021 – All rights reserved