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Mining and quarrying — Health and safety requirements —

Part 3: Open pit/surface mining

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In order to match with technological development and to keep continuous progress in industries, standards are subject to periodic review. Users shall ascertain that they are in possession of the latest edition

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Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

DRS 117-3 was prepared by Technical Committee RSB/TC 57, *Mining and related activities.*

In the preparation of this standard, reference was made to the following standard:

MINING SAFETY STANDARDS of March 2016 (Revised in December 2020). Rwanda Mines, Petroleum and Gas Board (RMB)

The assistance derived from the above source is hereby acknowledged with thanks.

RS 117 consists of the following parts, under the general title *Mining and quarrying*:

— *Part 1: Code of practice*

— *Part 2: General requirements*

— Part 3: *Open pit mining*

— *Part 4: Underground mining*

— *Part 5: Blasting*

Committee membership

The following organizations were represented on the Technical Committee on *Mining and related activities* (RSB/TC 57) in the preparation of this standard.

CIMERWA Plc

D&D Resources Ltd

Integrated Polytechnic Regional College (IPRC) - Karongi

Inter-African Mining Corporation (IMC) Ltd

LuNa Smelter Ltd

New Bugarama Mining (NBM) Ltd

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Rwanda Extractive Industry Workers Union (REWU)

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Rwanda Quarries Association (RQA)

Standards for Sustainability (SfS)

Trinity Metals

University of Rwanda - School of Mining and Geology (UR - SMG)

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Introduction

Mining and quarrying sector implies health and safety management to prevent harm to workers at the site. This responsibility imposes duties and promotes excellent health and safety management by employers. The environmental issues, safety and human rights should be the major concern of employers during the whole process of mining and quarrying production.

The present standards on health and safety requirements for mines and quarries is designed to support the national mining law and includes other subjects that are not dealt with in the current law on mine and quarry operations and that may have an influence on mineral traceability, transparency, good practice and on the environmental impact of mining and quarrying operations for mineral certification system by an independent certifier based on the levels of compliance with the requirements provided in this document.

Mines and quarries — Health and safety requirements Part 3: open pit/surface mining

1 Scope

This Draft Rwanda Standard provides specific health and safety requirements for quarries and open-pit mining. It covers requirements for surface mine plans, safety of open pit and quarry excavations, bench heights and widths, waste dumps and safety berms at pits.

General requirements are covered in DRS 117-2.

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.

There are no normative references in this document.

3 Terms and definitions

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

3.1

law

national law regulating specified operations in Rwanda

Note 1 to entry: Example of national law includes the law regulating mining and quarry operations in Rwanda, and law regulating labour Rwanda.

3.2

employer

company or cooperative that employs workers at the mining site

3.3

mine operator

representative of the holder of the exploitation license

Note 1 to entry: An example of the mine operator could be the Director, Manager or Chief Executive Officer of the license holder

3.4

minerals industry

companies and co-operatives engaged in exploration and extraction of minerals including metallic minerals, industrial minerals, non-metallic minerals, sand aggregate and gravel and clay

3.5

hazard identification

process of recognizing that a hazard exists and defining its characteristics

3.6

hazard

source or a situation with a potential for harm in terms of human injury, ill-health, damage to property, damage to the environment, or a combination of these

3.7

harm

that does not usually occur, or usually is not easily detectable, until a significant time after exposure to the hazard

3.8

holder

individual or institution in whose name a mining right is registered

3.9

mine

any place, quarry, pit, shaft, drive, level or other excavation, and any drift, gutter, lead, vein, lode, reef, saltpan or working, in or on or by means of which any operation connected with mining is carried on, together with all buildings, premises, erections and appliances, whether above or below the ground, that are used in connection with any such operation or for the extraction, treatment or preparation of any mineral or for the purpose of dressing mineral ores

3.10

adit

horizontal or nearly horizontal tunnel driven from the surface for the working of a mine

3.11

mineral

substance of economic value obtained by mining

[SOURCE ISO 22932-2:2020, 3.13.4]

3.12

mining

extraction of material, whether solid, liquid or gaseous from land or from beneath the surface of the earth in order to win minerals and includes any operations directly or indirectly necessary or incidental thereto

3.13

mining area

area of land subject to a mineral licence granted under the law regulating the issuance of mineral licence or mining licence

3.14

mining operations

operations carried out in the course of mining

3.15

mineral licence

mining licence, quarry licence or an exploration licence, granted under the law

3.16

risk

combination of the likelihood and consequences of a specified hazardous event occurring

3.17

risk assessment

overall process of estimating the magnitude of risk and deciding whether or not the risk is tolerable or acceptable

3.18

competent technician

person having the knowledge, experience, skill, and qualifications to carry out a particular task of supervision, drilling, blasting, plumbing, mining, electrical, civil and mechanical technician in mining as deemed as adequate by the competent authority upon assessment

Note 1 to entry: The qualifications and experience for competent persons shall be set by the competent authority.

19

competent authority

public institution responsible for implementing national standards, laws and regulations related to mining and quarrying operations

Note 1 to entry: Competent authority includes the authority in charge of mines and quarries, the authority in charge of environment management, the authority in charge of labour, investment or the local authority.

3.20

machinery

assembly of linked parts or components, at least one of which moves, with appropriate machine actuators, control and power circuits, joined together for a specific application, in particular for the processing, treatment, moving or packaging of a material

[SOURCE ISO 14159:2002, 3.13]

3.21

incident

unplanned event which results in damage or production loss but does not result in harm

3.22

inspector

personnel appointed by the competent authority in charge of mining and quarrying operations in Rwanda

3.23

quarry

any working open to the surface beneath the original surface for the purpose of extracting building or industrial minerals

3.24

accident

any unplanned event which results in harm

3.25

worker

any person who commits him/herself to put his/her professional activity in return for payment under the direction and authority of another physical or moral, public or private person

Note 1 to entry: worker includes employees, sub-contractors and artisanal miners

3.26

employers' professional organization

association of employers executing similar or related professions with the exclusive purpose of studying and defending their economic, and social interests

3.27

workplace

places where workers carry out their services, or where an employer carries out or directs two or several operations that are independent due to their size or mission. Each of these operations constitutes a separate workplace. A workplace may also be a place where one travels to or where the worker performs his/her functions while on mission

3.28

professional organization

organization that aims at advancing a particular profession, support the interests of people working in that profession and serve the public good

Note 1 to entry: Professional organization can also be referred to as a professional association or professional body

3.29

owner

person holding a valid mining or quarry licence

Note 1 to entry: The owner can be an individual or an organization

3.30

manager

person directly appointed by the owner

Note 1 to entry: The owner can be the manager.

3.31

employee

person having agreed to work for an employer under a contract concluded between them, and in return for remuneration

4 Requirements for quarries and open pit mining

4.1 Surface mine plans

4.1.1 At all mine sites, surface mine plans including mine layout shall be prepared and held at the site office to facilitate emergency responses and prevent injury and damage to services.

4.1.2 A Surface plan shall show:

a) the position of any principal surface erection, including explosives magazines, reservoirs, dams and other works of a similar nature and the position of any open cast working and borehole and any underground working or installation which shall be situated between the surface and 4.5 meters below the surface, and any other surface object which the competent authority may require to be shown;

b) the position of any river, main road and main powerlines;

c) the boundaries of the prospecting area, the exploration area and the mining area in which work is being carried out; in the case of a prospecting area whose boundaries are too extended to be shown on a plan of convenient size it shall be necessary to show only that portion of the area on which the surface equipment is situated leaving a reasonable margin for extension. In such case a key plan to any convenient scale shall also be made indicating all the prospecting and principal surface objects;

d) the position of any connection data to any surveyed triangulation or geodetic or boundary beacon within or without the area as may be required by the competent authority; and

e) the boundaries of any curved area and the position of any fence erected to protect such area.

4.2 Safety of open pit and quarry excavations

4.2.1 In open and quarry operations, where the vertical height of the face exceeds three metres and where explosives are used, bench drilling shall be carried out from the top of the bench.

4.2.2 A face shall not be drilled in a manner which shall create an overhang of the face, and where unconsolidated rock is mined; the face and sides shall be battered (that is, be at an appropriate angle) to prevent a collapse.

4.2.3 A face shall not be undercut by the excavation of a slot at the toe of the face apart from the purpose of driving a tunnel or adit being driven into the face.

4.2.4 Where a person is required to work manually at the bottom of the bench of a quarry face or on the face itself, the face shall be scaled of any loose rock which could fall on that person.

4.2.5 In an area close to population areas, the manager may need to fence against inadvertent access to the faces.

4.2.6 In open excavations, persons are not permitted to walk on the edge of excavations. They shall walk 2.5 m away from the edge of the excavation.

4.2.7 All loose material on the surface or on any bench shall be cleared to allow a clearance of at least 2 m from the edge.

4.2.8 In excavations mined manually, a face or sidewall shall not exceed a vertical height of 1.5 m unless the face or sidewall is sloping at an angle sufficient to ensure the safety of persons.

4.2.9 Where mechanical equipment is used for digging and loading, suitable precautions shall be taken to ensure that the operator of the equipment and any other person is not exposed to any danger from any face or sidewall.

4.3 Bench heights and widths

4.3.1 In mechanical operations, the open pits shall be designed with benches whose heights take into consideration the strength and characteristics of rock mass as determined by a competent technician.

4.3.2 Minimum requirements for bench heights and widths shall be followed:

a) the heights in softer rock shall not exceed 5 m at the given slope angles;

b) bench angle shall not exceed 50^0 in soft and stable rock areas; in hard rock areas, shall not exceed 80^0;

c) when shifting from one bench to the next, use a strong ladder at least 0.8 m wide or create an egress inclined no more than 45^0;

d) the bench width shall be considered using the following formula:

$$Bench\ width\ (m) = (0.2\ \times bench\ height) + 4.5\ m$$

NOTE The formula above is recommended by the *SME Mine Engineering Handbook* (1992).

e) the guide to the Berm height and width can be derived from the following formula:

$$Berm\ height = 1\ m + 0.04\ H\ (H = 10\ m)\ (Kennedy)$$

4.3.3 Mined out pits must be refilled or fenced and warning sign.

4.3.4 Manual work at a bench height exceeding 2.5 m shall be restricted. When it is unavoidable, the workers shall wear a safety harness and rope that is fastened to a secure anchor well clear of the top of the face.

NOTE Safety harness and ropes used shall be inspected to be in good condition and approved to be used for work.

4.4 Waste dumps

4.4.1 Dumping shall be systematic and top soil materials that can be used for re-vegetation shall be dumped and stockpiled separately.

4.4.2 The waste dumps shall be designed taking into consideration the rock type. The soft rock type such as sandstones, clays and schists shall be dumped in such a way that the slope angle does not exceed the natural angle of repose. The broken or crushed rock dump shall have a slope angle not exceeding the natural angle of repose.

4.4.3 The dumps shall be designed in such a way that there is a berm on the edge of the dump and a retaining catchment berm at the foot of the dump. The berm height where dumping by vehicles shall be 50% of the dump vehicle tyre size.

4.4.4 The height of the dump shall not exceed 10 m. At such height, the slope angle shall not result in that greater than the natural angle of repose for the given materials.

4.5 Safety berms at pits

The dimensions (height and width) of the safety berm on the open pit haul roads and benches are determined using the following formulae:

a) $Berm\ height\ = 50\ \%\ of\ the\ tyre\ diameter$

b) $Berm\ width\ = 2 \times berm\ height/tan\ 35°$

4.6 Blasting

Blasting operations shall be carried out in accordance with DRS 117-5.

Bibliography

[1] ISO 22932-2:2020, *Mining — Vocabulary — Part 2: Geology*

[2] ISO 14159:2002, *Safety of machinery — Hygiene requirements for the design of machinery*

[3] Law N° 66/2018 of 30/08/2018, *Law regulating labour in Rwanda*

[4] Ministerial Order N° 013/MOJ/AG/19 of 16/07/2019 *determining requirements for granting authorisation to import, manufacture, transport, trade in and use dynamites in mining and quarry operations (Article 24)*

[5] RS 413: 2020, Furniture — *Quality and grading of wooden furniture*

[6] N° 02/MIFOTRA/22 of 30/08/2022, *Ministerial Order on occupational safety*

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