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Mine closure and reclamation planning —

Part 1: Requirements

Planification de la fermeture et de la restauration des mines —

Partie 1: Exigences

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Foreword

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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 shall be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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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*, Subcommittee SC 7, *Mine closure and reclamation management*.

A list of all parts in the ISO 21795 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.

Introduction

This document provides requirements and recommendations for mine closure and reclamation planning applicable to both new and operating mines. The overarching objective is to promote consistency and quality in planning for mine closure and reclamation internationally. ISO 21795-2 provides guidance for implementation of this document.

The intended audience are those with responsibility for, or an interest in, planning for mine closure and reclamation. This includes mine planners and designers, mine operators, regulators, environmental assessors, communities, indigenous peoples, and financial stakeholders, amongst others.

Mine planning, design and operations must be fully integrated with the closure and reclamation process. Early, continual and comprehensive mine closure and reclamation planning is essential for all new and operating mines because it:

— leads to the highest degree of environmental and social success, usually at a lower cost than if mine closure and reclamation planning is not done from the beginning of the mining project;

— reduces risks and liabilities throughout the mine's operational life and on closure;

— allows for stakeholder involvement throughout, so that relevant knowledge and understanding are brought into the planning process;

— allows for devoting more attention to sustainable development activities identifying socio-economic opportunities for the various closure phases;

— helps build trust with governments, stakeholders and international communities;

— provides additional planning time to understand the complexity of the biophysical characteristics and socio-economic context of each mine site;

— provides for continual improvement and updating of closure and reclamation plans;

— allows companies to better integrate closure and reclamation activities with operations;

— provides time to identify, research and develop new technologies for mine closure strategies and mine closure treatments that increase robustness and resilience of mine closure and reclamation; and

— allows companies to better provision for and schedule closure and reclamation funding.

There are many leading practices and guidance documents related to mine closure and reclamation planning available in various jurisdictions and used by many mining companies and stakeholders. This document captures the intent of such guidance documents so that it can be applied globally.

Mine closure and reclamation planning —

Part 1:
Requirements

1 Scope

This document specifies a framework and the processes involved in mine closure and reclamation planning for new and operating mines. Requirements and recommendations are provided on:

— mine closure and reclamation plan objectives and commitments;

— technical procedures and techniques;

— mitigation of socio-economic impacts;

— financial assurance and associated planning;

— mine closure and reclamation planning for unplanned closure;

— post-closure management plan; and

— mine closure and reclamation plan documentation.

The following aspects of mine closure and reclamation are not addressed in this document:

— infrastructure such as rail lines, ports, off-site ore loaders, power stations, etc. that are associated with the mine operation, but which are not located at the mine site;

— detailed survey, testing or monitoring methods, detailed engineering procedures, detailed product requirements, or detailed construction and operational procedures; occupational health and safety management related to closure and reclamation, construction and exploration activities;

— relinquishment of a closed and reclaimed mine site, or portions thereof, to a party (governmental or private entity) not related to the mine operator;

— specific requirements for dealing with the radiological aspects of mine closure and reclamation, such as those that occur at uranium mining and processing facilities and other mines at which naturally occurring radioactive materials are present; however, the other aspects associated with closure and reclamation of these mines are included in this document; and

— closure and reclamation of abandoned mines.

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 20305, *Mine closure and reclamation — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20305 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 https://www.electropedia.org/

4 Mine closure and reclamation planning framework

Mine closure and reclamation planning is required for all areas affected or potentially affected by the mining infrastructure and operations. The potentially affected areas include those on which the mine facilities are located, and adjacent areas that can potentially be impacted by surface water, groundwater and air quality from the mining facilities. In some cases, the potentially affected areas can be located across an international border in another country. The affected and potentially affected areas should be clearly defined in the closure and reclamation plan.

Six framework elements, shown in Figure 1 and detailed in Clause 5, form the foundation for establishing and maintaining effective mine closure and reclamation planning. This framework applies through the mine closure and reclamation planning and implementation process, from initial mine planning through to long-term post-closure. Details are provided on the processes, activities and steps necessary to implement the framework in Clause 6.

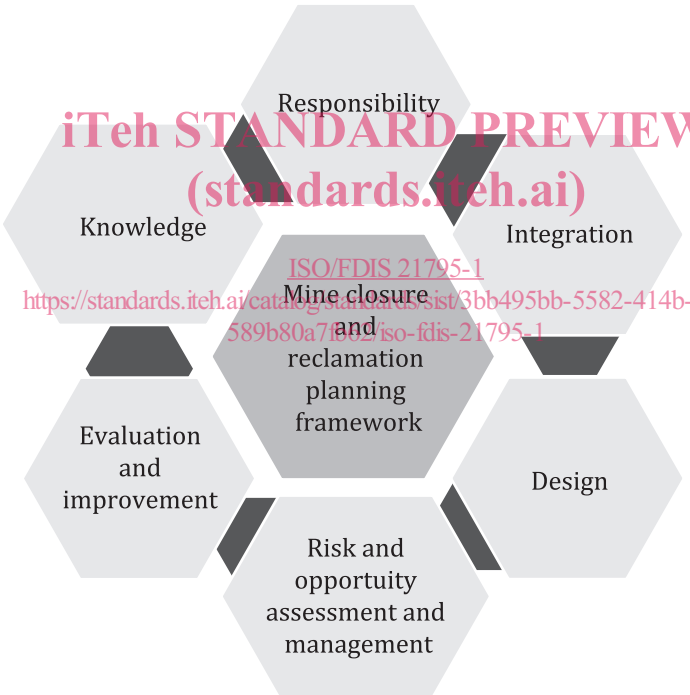

Figure 1 — Mine closure and reclamation planning framework

Each framework element is further explained below.

Responsibility — company responsibility (see 5.1.1), including stakeholder engagement (see 5.1.2), is inherent to the entire mine closure and reclamation planning process. Local jurisdictional requirements can exist (see 5.1.3). Financial management and provisioning for closure (see 5.1.4) is critical to responsibility.

Integration — mine closure and reclamation planning is an integral part of the mining life cycle, including with respect to physical and chemical controls for sustainable land and water use (see 5.2.1). Mine closure and reclamation treatments are required to be resilient (see 5.2.2 and 5.2.3), considering socio-economic considerations in the transition to closure (see 5.2.4). Engagement with stakeholders on mine closure and reclamation (see 5.1.2) is also a critical element.

Design — it is developed in the context of meeting closure and rehabilitation objectives, which in turn are developed in consultation with stakeholders (see 5.3.1 and 5.1.2). Robust lifecycle design and management should reflect this, so as to facilitate successful mine closure and reclamation (see 5.3.3).

Risk and opportunity assessment and management — it is the process to assess and manage mine closure and reclamation risks, and to identify and act on opportunities throughout the life of the mine (see 5.4).

Evaluation and improvement — quality assurance provides the maintenance of the mine closure and reclamation planning standard at the corporate and operational level (see 5.5.1), while the process of adaptive management facilitates continuous improvement through the life of the mine (see 5.5.2).

Knowledge — identifying uncertainty through knowledge gaps, building knowledge, managing, disseminating and retaining knowledge and data that support mine closure and reclamation planning throughout the life of the mine and beyond (see 5.6).

5 Framework elements for mine closure and reclamation planning

5.1 Responsibility

5.1.1 Mine operator responsibility

Mine closure and reclamation are mine operator responsibilities, and the associated planning shall be incorporated in mine operator policies and procedures and be endorsed by mine operator executives with enough authority to allocate the necessary financial and human resources. Mine operators shall demonstrate that they have internal policies, procedures and standards to conduct mine closure and reclamation planning and that these are embedded within organizational systems.

The respective roles and responsibilities for mine closure and reclamation for any given mine site shall be established and clearly documented in relevant corporate and operating policies, plans and procedures. Individuals responsible for mine closure and reclamation planning shall have the necessary competencies, including education, training and experience to understand regulatory and other requirements.

5.1.2 Stakeholder engagement

Stakeholders shall be engaged at all stages of the life-of-mine planning process. Outcomes of engagement shall be addressed in mine closure and reclamation plans and in their implementation. Stakeholders shall be identified early and updated progressively and include, the mine operator, rights holders, downstream communities, regulators, non-government organizations, investors, community groups, as well as future land and water users.

5.1.3 Regulations

Mine closure and reclamation planning and design can be covered in local, national and regional regulations.

5.1.4 Financial plan

The mine operator shall develop a financial plan that details what the financial provisions are for each stage of the life of the mine, including provisions for unplanned closure and post-closure requirements. These shall include provisions for the necessary cash flow needed to fulfil the commitments of the mine closure and reclamation plan.

5.2 Integration

5.2.1 Physical and chemical control for sustainable land and water use

Mine closure and reclamation planning and design shall meet established objectives and commitments (as described in 5.3.1), leave the mine site in a stable and safe condition and provide for ongoing post-mining land use. Mine features shall not release chemicals into the air, water or surrounding soils that result in unacceptable impacts to human health or the environment as determined by site-specific risk assessments.

To meet these requirements, the mine operator shall establish measurable mine closure and reclamation completion criteria that shall be used to determine when mine closure and reclamation objectives have been met. The mine operator also shall provide for monitoring of the success of mine closure and reclamation activities.

5.2.2 Mine closure and reclamation treatment resilience

Mine closure and reclamation treatments shall be resilient so that they can respond to changes and risks in a dynamic environment. The treatments shall provide for meeting the closure and reclamation objectives prior to, during, or following changes and disturbances, so that these objectives are met and sustained under both expected and unexpected conditions.

Mine closure, reclamation planning and design shall provide sufficient resilience to reduce the risk of catastrophic and/or chronic failure and to enhance the potential for post-closure facilities and landforms to adapt to changed conditions as necessary to still meet the design intent following damaging natural events with minimal active management. The mine closure and reclamation plan shall also demonstrate that post-closure facilities and landforms have been designed for closure in a manner sufficiently resilient to cope with the effects of climate change.

5.2.3 Long-term post-closure and reclamation

The post-closure phase shall provide for adaptive management, and for ongoing environmental protection until completion criteria and post mining land-use requirements are met, and shall include site management that provides necessary monitoring, inspections, reporting, maintenance, and repairs, as well as regular certifications of the integrity of mine waste containment structures. Secure long-term funding shall be available to support these activities.

The mine closure and reclamation plan shall consider options for potential access controls to protect human health and safety and the integrity of the post-closure environment and post mining landforms. Access controls can include physical controls that are compatible with the land-use objectives and/or legal land-use restrictions or covenants on the property.

5.2.4 Social transition to closure

Stakeholder engagement and communication is integral to developing plans for social transition, through all the process of the project. Planning for social transition shall include provisions both for social transition costs, such as ongoing consultation and engagement, workforce adaption and community financial preparedness, and for potential social investment projects that will support communities when mining ends and there is a transition to a post-closure land use.

5.3 Design

5.3.1 Mine closure and reclamation objectives and commitments

Mine closure and reclamation objectives and commitments shall be established as a basis for mine closure and reclamation planning. With equal priorities, these objectives shall include the management of human health and environmental risks, providing for the sustainability of the mine closure and reclamation works and resulting land use, and reducing long-term maintenance requirements and

liabilities. The objectives shall also consider the results of stakeholder engagement, that regulations can apply, and the mine operators' requirements.

Objectives and commitments shall also address socio-economic and cultural aspects of mine closure and reclamation. This shall include managing the transition of the workforce and communities through to and beyond closure. It shall also consider future post-closure opportunities provided by the closed and reclaimed site for the local communities and indigenous peoples where relevant.

Objectives shall establish goals and standards to be achieved, while commitments shall include specific actions that the mine operator agrees to undertake.

5.3.2 Timely mine closure and reclamation planning

For new mines, mine closure and reclamation planning, including the associated post mining land-use planning, shall commence with the initial mine development planning, be included in the environmental and socio-economic assessment and permitting of the mining project, and be continually refined and updated thereafter as necessary. For operating mines, mine closure and reclamation planning and execution shall be undertaken as soon as possible in accordance with the requirements in this document. Stakeholder engagement shall be undertaken to share knowledge and reach agreement on mine closure and reclamation objectives, post-mining land use and timing of the works.

5.3.3 Mine design and operation for mine closure and reclamation

Mine planning, design and operations shall be fully integrated with the closure and reclamation process, and shall consider the closure and reclamation requirements and the post-closure land use. Scheduling of progressive closure and reclamation shall be included for mine features and domains such as tailings and waste rock management, mine pits, underground workings, heap leach management facilities, processing facilities, water management infrastructure, and all forms of supporting and service infrastructure to optimise mine closure and reclamation outcomes. The elements of mine closure planning and design shall be developed and matured in accordance with industry practice for capital project development and associated progressive mine closure and reclamation schedules.

5.4 Risk and opportunity assessment and management

Risks of failure of the mine closure and reclamation plan elements and risks to achieving the post-closure and reclamation objectives shall be assessed and managed by implementing appropriate risk management plans. These risks include those to human health and safety, the environment and communities. The residual risks remaining after risk management is implemented shall also be identified. These risk management plans shall be regularly updated during the operating phase of the mine, so they reflect current knowledge and stakeholder expectations.

Mine closure and reclamation opportunities shall be identified and managed throughout the lifecycle of the mine and shall be included in the mine closure and reclamation plan.

5.5 Evaluation and improvement

5.5.1 Quality assurance

Quality assurance shall be used by the mine operator to maintain a high standard of planning, design and construction of mine closure and reclamation.

Quality assurance shall be provided by competent and qualified professionals. It shall include, as a minimum, the peer review of the mine closure and reclamation plan, the design during its various stages of development, and inspections and certifications of the integrity of post-closure facilities and post mining landforms that are to remain in place. The mine operator shall have policies in place that require quality assurance be performed based on a quality assurance plan that is part of the mine closure and reclamation plan implementation.

