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General principles for assessment of green mine

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Foreword

This document is drafted in accordance with GB/T 1.1—2020 "Guidelines for Standardization Work Part 1: Structure and Drafting Rules of Standardization Documents".

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Introduction

The development of green mine is a fundamental requirement for the mining industry to advance ecological civilization and achieve high-quality growth. Through green mine construction, the concept of green development is integrated into the entire process of mineral resource utilization and protection, guiding mining enterprises to adopt environmentally friendly, resource efficient, low energy consumption, and low emission technologies, processes, and equipment. These measures minimize ecological disturbances caused by resource exploitation in mining areas and their surroundings, ultimately establishing a new model of green mining characterized by high technological sophistication, low resource consumption, and minimal environmental impact.

This document establishes comprehensive and systematic general requirements for green mine evaluation, which aligns with the requirements of ecological civilization construction, green development, and the "dual carbon" initiative, while considering the operational patterns of mining operations to meet the needs of the mining industry.

General principles for assessment of green mine

1 Scope

This document specifies the general principles and requirements for green mine evaluation, including aspects such as mining operations, resource utilization, green and low-carbon practices, ecological restoration, technological innovation and standardized management, as well as mine appearance and evaluation criteria.

This document applies to operational mines and serves as the overarching framework for establishing green mine evaluation standards or implementation guidelines at industry, local, or mine levels.

2 Normative References Documents

The content of the following documents constitutes essential terms of this document through their normative references. For dated references, only the version corresponding to that date applies to this document; for undated references, their latest version (including all amendments) applies to this document.

GB/T 2589 General Rules for the Calculation of Comprehensive Energy Consumption

GB 8978 Comprehensive Wastewater Discharge Standard

GB 12348 Environmental Noise Emission Standards for Industrial Enterprises

GB 15618 Soil Environmental Quality Risk Control Standard for Agricultural Land Pollution (Trial)

GB 16297 Comprehensive Emission Standard for Air Pollutants

GB 18597 Hazardous Waste Storage Pollution Control Standard

GB 18599 Pollution Control Standard for Storage and Landfill of General Industrial Solid Wastes

GB/T 23331 Requirements and Guidelines for Energy Management Systems

GB/T 25953 Nonferrous Metal Concentration and Recovery of Iron Concentrate

GB/T 32150 General Rules for the Accounting and Reporting of Greenhouse Gas Emissions from Industrial Enterprises

GB 36600 Soil Environmental Quality Risk Control Standards for Soil Pollution in Construction Land (Trial)

GB 50187 Design Code for Industrial Enterprise General Layout

GB 50197 Design Code for Open-pit Coal Mines

GB 50215 Design Code for Coal Industry Mine

GB 50359 Design Code for Coal Washing and Processing

GB 50595 Design Code for Energy Conservation in Non-Ferrous Metal Mines

GB 50598 Design Code for Cement Raw Material Mining Engineering

GB 50612 Design Code for Metallurgical Mines and Mineral Processing Plants

GB 50771 Design Code for Nonferrous Metal Mining

GB 50782 Design Code for Non-ferrous Metal Ore Beneficiation Plant Process

GB 50830 Design Code for Mining Operations in Metallurgical Mines

GB 50863 Design Code for Gangue Facilities

GB 50970 Engineering Design Code for Open-pit Mining of Decorative Stone Materials

GB 50988 Engineering Design Code for Environmental Protection in Nonferrous Metal Industry

GB 51053 Energy-saving Design Code for Coal Industry Mines

GB 51197 Energy-saving Design Specifications for Open-pit Coal Mines

GBZ 2.1 Occupational Exposure Limits for Hazardous Factors in Workplaces Part 1: Chemical hazardous Factors

DZ/T 0376 Construction Specifications for Intelligent Mines

HG/T 22815 Design Code for Water-Soluble Mining in Chemical Mines

HG/T 22816 Design Code for Mining of Salt Lake Brine in Chemical Mines

HJ 25.6 Technical Guidelines for Groundwater Remediation and Risk Control in Contaminated Sites

HJ 1209 Technical Guidelines for Self-Monitoring of Soil and Groundwater in Industrial Enterprises (Trial)

TD/T 1036 Quality Control Standard for Land Reclamation

TD/T 1070 (All parts) Technical Specification for Ecological Restoration of Mines

3 Terms and Definitions

The following terms and definitions apply to this document.

3.1 Green mine

The mine should be developed in the way of scientific exploitation, efficient utilization of resources, ecological environment, standardized management and harmonious mining area.

3.2 Mining recovery

The percentage of extracted pure ore (resource reserves) relative to the mineral resource reserves consumed during the period.

3.3 Mineral processing recovery

The percentage of a useful component in the concentrate to the mass of the same component in the raw ore is defined as the mineral processing product.

3.4 Total recovery of associated and coexisting minerals

The percentage of the quality of the useful components co-occurring in the final products and the quality of the useful components co-occurring in the mineral resources reserves consumed in the current period.

3.5 Mine ecological restoration

The geological environment destruction, land damage and vegetation destruction caused by the exploitation of mineral resources should be solved by the measures of prevention and restoration, relying on the guidance of artificial support and the natural recovery force, so that the geological environment of the mine can reach the safety and stability, the damaged land can be reclaimed and used, and the function of the ecosystem can be restored or improved.

4 General Principles and Requirements

4.1 General Principles

4.1.1 We should adhere to the principles of respecting, complying with and protecting nature, and establish a green production mode for mineral resources.

4.1.2 Adhere to the goal orientation and result orientation, promote the development of green mining industry by the construction of green mine.

4.1.3 We will adhere to the principles of ecological priority, conservation and intensive use, and green and low-carbon development, and integrate the concept of energy saving,

pollution reduction and carbon reduction into the whole process of green mine construction and evaluation.

4.1.4 The ecological function was restored or improved by combining artificial guidance with natural recovery.

4.2 General Requirements

4.2.1 The mine should operate normally and not be listed in the abnormal list or the serious dishonesty list of the mining right holder's exploration and mining information public disclosure system during the evaluation period.

4.2.2 The mining area and its direct environmental pollution impact zone must comply with ecological and environmental zoning control requirements. Mining enterprises must obtain environmental impact assessment, discharge permits, and other ecological and environmental protection procedures as required, and strictly implement them.

4.2.3 The exploitation of resources should adopt the way of resource saving and environment friendly, minimize the disturbance of the exploitation of resources to the surrounding environment, and realize the comprehensive exploitation and utilization of the co-occurring mineral resources.

4.2.4 The production of mine should meet the requirements of energy saving and emission reduction, the ecological environment of mine area should be comprehensively treated and restored, and the regional ecosystem should develop in a benign way.

4.2.5 The mining enterprises should manage the standard, fulfill the social responsibility, establish the management system of green mine, and harmonize the relationship between the mine and the local area.

4.2.6 The mining area should be rationally arranged in functional zoning and the environment should be clean and beautiful.

5 Mining

5.1 In mining operations, emphasis is placed on ecological protection, energy conservation, and resource efficiency, ensuring full utilization of resources while continuously optimizing development methods. The mining design complies with relevant standards including GB 50197, GB 50215, GB 50598, GB 50771, GB 50830, GB 50970, GB 50988, HG/T 22815, and HG/T 22816.

5.2 According to the mining technical conditions, the mining sequence and mining method should be adopted to achieve the mining of rich and poor, the thick of unmined and the thin of abandoned, the rich of mining and the poor of abandoned.

5.3 The mining recovery rate (including recovery ratio, fluid reinjection rate, bottled water utilization rate, and barrelled water utilization rate) must meet the “Three Rates” requirements for rational mineral resource development and utilization, and the calculation method for recovery rate shall comply with the relevant provisions in Appendix A.

5.4 The mining activities should meet the requirements of cleaner production, minimize the disturbance to the natural environment, and adopt the mining technology, process and equipment with high resource utilization, less waste production and less ecological damage.

5.5 Mining activities are implemented according to the mineral resource development and utilization plan and design to improve the efficiency of mineral resource exploitation. The geological conditions of the lower part of the waste rock dump are stable, and it avoids

occupying the recoverable mineral resources, and it is convenient to use the waste rock for environmental remediation and land reclamation in the mining area.

5.6 The principle of stripping and mining together and stripping first should be adhered to in open-pit mining, and the technology of stripping, waste discharge, mining and ecological restoration should be adopted.

5.7 Open-pit mining follows the top-down mining sequence and is divided into steps. The height of the steps, the slope angle of the steps, the final slope angle, and the width of the working platform all meet the design requirements.

5.8 Underground mining adopts mining methods to reduce the surface subsidence deformation, and gives priority to filling mining, stratified mining, height-limited mining, and co-mining of associated resources, etc. in order to protect the resources and environment, take effective measures to prevent or reduce the adverse effects on the ecological environment, reduce land occupation, and improve the mining recovery rate.

5.9 The drilling waste of oil and gas exploitation should be treated in a centralized and harmless way.

6 Resource Utilization

6.1 Recovery of Mineral Processing

6.1.1 For the raw ore mined, advanced and reasonable separation processes should be adopted based on the ore's selectability, and the beneficiation process design should comply GB/T 25953, GB 50359, GB 50612, GB 50782, GB 50863.

6.1.2 Mineral processing is carried out based on the mineralogical characteristics of the ore process, with staged separation, staged use, and high-quality use. The beneficiation recovery rate (raw coal feed rate) index complies with the requirements of the "Three Rates" index for the rational development and utilization of mineral resources. The calculation method of the beneficiation recovery rate should conform to the relevant provisions of Appendix A.

6.1.3 The mineral processing procedure minimizes energy consumption, reduces the discharge of gangue, waste residues and other wastes, and maximizes the utilization efficiency of mineral resources. Non-toxic or low-toxicity beneficiation reagents should be used in flotation and chemical beneficiation processes.

6.1.4 For comprehensive and difficult-to-treat ores, new processes and technologies such as green, low-carbon, clean and efficient ones should be adopted to increase the recovery rate of mineral processing.

6.1.5 The main production areas such as the crushing workshop and the conveying corridor should be fully enclosed and equipped with dust collection and dust suppression facilities.

6.2 Comprehensive Utilization

6.2.1 Under the condition of economic rationality, the main mineral and the associated mineral are fully utilized. The main mineral is processed according to its quality and the high quality is used for high quality. The comprehensive utilization rate of the associated mineral meets the requirements of the "Three Rates" of the rational exploitation and utilization of mineral resources, and the calculation method should conform to the relevant provisions of Appendix A.

6.2.2 Solid waste can be treated and utilized reasonably by extracting useful components,

backfilling, paving and producing building materials.

6.2.3 The comprehensive utilization scheme of mine water should be formulated to dispose and utilize mine water and mine wastewater effectively.

7 Green and Low-Carbon

7.1 Economical Intensive Land Use

Land use for mining should be optimized and used scientifically according to the principle of economical and intensive land use, making full use of wasteland and inferior land, occupying less cultivated land, and meeting the requirements of industrial land use control index and land saving evaluation.

7.2 Energy Conservation and Consumption Reduction

7.2.1 An energy management system should be established, covering energy indicators, energy efficiency, and measures for energy use and consumption, in compliance with standards such as GB/T 23331, GB 50595, GB 51053, and GB 51197. Through systematic energy management, we can reduce energy costs, cut greenhouse gas emissions, and minimize other environmental impacts.

7.2.2 Comprehensive energy consumption measurement shall be conducted, with the calculation scope, methodology, and standard coal equivalent conversion requirements complying with GB/T 2589. The comprehensive energy consumption per unit product must meet the corresponding energy consumption limit requirements.

7.3 Carbon Reduction

To implement carbon reduction policy requirements, greenhouse gas emissions within the mining area must be calculated and reported, with control measures taken as required. The calculation method shall comply with the provisions of GB/T 32150.

7.4 Source Prevention

7.4.1 For mine areas and surrounding groundwater with functional usability, their environmental conditions must meet the specified functional limits. When human-induced factors cause groundwater to fail to meet these requirements, remediation and risk control measures for groundwater pollution should be implemented in accordance with HJ 25.6.

7.4.2 Strengthen source prevention by implementing effective measures to mitigate environmental impacts on soil and groundwater. Mines experiencing acidic rock drainage should adopt measures such as precious metal recovery, rainwater drainage, recharge control, and mine backfilling to reduce environmental impacts. Mines listed as key soil pollution supervision units should conduct regular hazard inspections in key areas and facilities, with soil and groundwater monitoring meeting the requirements of HJ 1209.

7.5 Waste Disposal and Discharge

7.5.1 The solid waste disposal complies with the requirements of GB 18597 and GB 18599.

7.5.2 The discharge of domestic sewage and industrial wastewater meets the requirements of GB 8978 and the industry and local standards.

7.5.3 The concentration and rate of mine dust emission and the sampling monitoring meet the requirements of GB 16297. Dust removal and dust capturing equipment are added to the fixed dust emission points to suppress and treat the dust produced in the process of mining and processing. The contact limit of harmful factors meet the requirements of GBZ 2.1.

7.5.4 The bulk materials and products should be transported by railway, waterway, pipeline or belt conveyor, etc. The dust suppression equipment should be installed along the transportation road, and the dust suppression measures should be taken for the ground transportation vehicles and equipment. The waste rock and ore transfer site should be equipped with dust suppression facilities.

7.5.5 The high noise equipment in the mining area should be treated to reduce noise, environmental risk prevention measures should be taken, and the noise emission limit of the factory boundary should meet the requirements of GB 12348.

8 Ecological Remediation

8.1 A mine geological environmental protection and land reclamation plan shall be developed and approved. Based on this plan, an annual land reclamation and ecological restoration plan shall be formulated and reported as required. The mine geological environment restoration fund shall be fully established in accordance with standards and used appropriately, with funds allocated for comprehensive geological environment restoration and land reclamation.

8.2 In accordance with the requirement of "recovery and restoration simultaneously", the annual plan should be made and implemented according to the overall plan of mine geological environment protection and land reclamation.

8.3 Adopt location-specific strategies and tailored measures. In compliance with territorial spatial planning and regulatory requirements, implement land use policies that prioritize afforestation where appropriate, cultivation where suitable, water conservation where feasible, construction where permitted, and wilderness preservation where applicable. For mineral resource exploitation that damages land, initiate land reclamation and ecological restoration to ensure mine geological environments achieve safety and stability, rehabilitate degraded land for sustainable use, and restore or enhance ecosystem functions. Local species shall be prioritized during reclamation and ecological restoration efforts.

8.4 The mine ecological restoration complies with the requirements of TD/T 1036, TD/T 1070 (all parts), and other relevant standards.

8.5 For land reclaimed for agricultural use, the soil pollution risk control complies with the requirements of GB 15618; for land reclaimed for construction use, the soil pollution risk control complies with the requirements of GB 36600.

8.6 Dynamic monitoring should be conducted for the destruction and restoration of geological environment, the damage and reclamation of land, and the destruction (degradation) and restoration of ecosystem, which should meet the requirements of TD/T 1070 (all parts).

9 Scientific and Technological Innovation and Standardized Management

9.1 Scientific and Technological Innovation

9.1.1 The mining and beneficiation technology, technique and equipment which are encouraged, supported and promoted by the state should be adopted.

9.1.2 It is necessary to introduce, transform and research and develop advanced and applicable technologies in the aspects of efficient utilization of resources, green and low-carbon, and to carry out technical training, exchange and cooperation.

9.1.3 The investment in R&D and technological transformation shall not be less than 1.5% of the mine's main business revenue from the previous year.

9.1.4 It is necessary to be equipped with necessary geological, mining, mineral processing and ecological environment protection and other professional technical personnel.

9.2 Digital Mine

9.2.1 It is necessary to realize digital and automatic control of the production and operation elements such as mine geology and survey, mineral resources reserve management, mining, mineral processing, ecological environment protection, etc.

9.2.2 It is necessary to establish a centralized control platform for mine automation, which can display the mine production automation system, resource reserve management system, online monitoring system, etc.

9.2.3 It is recommended to adopt technologies such as big data and intelligent control to construct smart mines in accordance with the DZ/T 0376 standard.

9.3 Standardized Management

9.3.1 The management system of enterprise should be standardized, the management system should be established to adapt to the green production and life style, the information of exploration and mining of mining right holder should be filled in according to the regulations, and the emergency response mechanism of ecological environment safety and other emergencies should be established.

9.3.2 According to the objectives, tasks and measures of green mine construction, an assessment mechanism should be established and annual self-evaluation should be carried out.

9.3.3 The management system of green mine should be established, the construction of green mine should be integrated into the whole process of daily management of mine, and the training should be carried out regularly.

10 Mineral Appearance

10.1 Functional Zone

10.1.1 The zoning of production, living and management areas complies with GB 50187, and the safety distance between the waste dump and the ore dressing plant and the living area is maintained.

10.1.2 Production equipment and materials are sorted and placed in designated areas in an orderly manner.

10.2 Supporting Facilities

10.2.1 The Production and Living Facilities Are Fully Equipped and Operate Normally, With Standardized Management. The Buildings and Structures Are Neatly Arranged and Maintained Promptly.

10.2.2 The signboard of the production area is neat.

10.3 Sanitation and Greening

10.3.1 The production area, management area and living area are kept neat and hygienic, and there is no unauthorized construction. The natural conditions and topography of the mining area are fully utilized to carry out the greening of the mining area according to local conditions.

10.3.2 Household waste has a fixed collection place, and it is advisable to carry out

classification treatment.

10.3.3 The main roads in the mining area are smooth and clean, and it is suitable to set up isolation green belts, make propaganda boards or slogans, etc. The internal roads are kept clean and hygienic, and there is no scattered objects.

11 Evaluation

11.1 Evaluation Requirements

11.1.1 The evaluation of green mines should be based on the characteristics of different industries, regions or mines, and the corresponding evaluation schemes should be formulated. The evaluation guidelines should specify the characteristics of industries, regions or mines in Chapters 4 to 10, and the evaluation schemes should define the evaluation indicators and comprehensive scoring criteria.

11.1.2 The evaluation framework encompasses six key dimensions: mining operations, resource utilization, green and low-carbon practices, ecological restoration, technological innovation and standardized management, and mine appearance. In accordance with Chapters 4 through 10, comprehensive evaluation criteria are established based on the advanced standards achievable by the industry, local regions, or individual mines. The indicator system must incorporate all requirements specified in this document, with the Green Mine Evaluation Index Table detailed in Appendix B.

11.1.3 The technical framework of the green mine evaluation standard formulated in this document is shown in Appendix C.

11.2 Evaluation Method

11.2.1 Green mine evaluation can be carried out by the first party, the second party or the third party. When the evaluation results are used for external publication, the evaluation should include at least a third party organization which is independent ofthe mine and has the corresponding ability.

Note: For the evaluated organization, the first party is the organization itself, the second party is the organization's stakeholders, and the third party is any other organization not directly related to the organization.

11.2.2 The organization that carries out the evaluation should check the report documents, statistical reports, original records, and conduct interviews with relevant personnel according to the actual situation, collect evaluation evidence by means of field investigation, and form an evaluation report, and ensure the integrity and accuracy of the original evidence.

Appendix A
(Normative)
Calculation Methods of Green Mine evaluation indicators

A.1 Mining Recovery

Calculate the mining recovery rate using formula (A.1):

$$K=\frac{Q_c}{Q}\times 100\%=\frac{Q-Q_s}{Q}\times 100\%=(1-S)\times 100\% \quad \cdots\cdots\cdots\cdots\cdots\cdots (A.1)$$

In the formula:
K — Mining Recovery Rate;
Qc — The current ore production (resource reserves), measured in tons (t);
Q — The current consumption of resources reserves, measured in tons (t);
Qs — The current loss of resources reserves, measured in tons (t);
S — Mining Loss Rate.

A.2 Recovery Ratio

The recovery ratio for oil, natural gas, and carbon dioxide gas are defined as the percentage of recoverable reserves relative to the consumption of resources reserves during the reporting period. The recovery ratio for potassium salts and bromine are defined as the percentage of extracted quantities compared to the consumption of resources reserves. These rates are calculated using formula (A.2):

$$K_e=\frac{Q_{ce}}{Q_e}\times 100\% \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (A.2)$$

In the formula:
Ke — Recovery Ratio;
Qce — Recoverable reserves (output), measured in tons (t) or cubic meters (m^3);
Qe — Current utilization (consumption) of resource reserves, measured in tons (t) or cubic meters (m^3).

A.3 Geothermal Fluid Reinjection Rate

The geothermal fluid reinjection rate is defined as the percentage of reinjected resources relative to the current period's extracted reserves. It is calculated using formula (A.3):

$$K_s=\frac{Q_{cs}}{Q_s}\times 100\% \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (A.3)$$

In the formula:
Ks — Geothermal Fluid Reinjection Rate;
Qcs — The volume of geothermal fluid resources for reinjection, measured in tons (t);
Qs — Current period's geothermal fluid reserves, measured in tons (t).

A.4 Bottled Mineral Water Utilization Rate (Barrelled Water Utilization Rate)

The utilization rate of bottled mineral water and barrelled water refers to the percentage of the finished product volume to the current period's mining volume. This rates are calculated using formula (A.4):

$$K_w=\frac{Q_{cw}}{Q_w}\times 100\% \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (A.4)$$

In the formula:

Kw — Bottled Mineral Water Utilization Rate (Barrelled Water Utilization Rate);

Qcw — Finished product volume of bottled water (barrelled water), measured in tons (t);

Qw — Current period's mining volume of mineral water, measured in tons (t).

A.5 Mineral Processing Recovery Rate

Calculate the mineral processing recovery rate using formula (A.5):

$$\varepsilon = \frac{\sum_{i=1}^{n} Q_{Ki} \cdot \beta_i}{Q_0 \cdot \alpha} \times 100\% \qquad \cdots\cdots (A.5)$$

In the formula:

ε — Mineral Processing Recovery Rate;

n — Number of concentrate types;

QKi — Mass of concentrate i, measured in tons (t);

βi — Grade of concentrate i, %;

Q0 — Mass of raw ore, measured in tons (t);

α — Grade of raw ore.

A.6 Raw Coal Selection Rate

Raw coal selection rate is the percentage of raw coal processed in the current period relative to total raw coal output. It is calculated using formula (A.6):

$$\varepsilon_m = \frac{Q_k}{Q_m} \times 100\% \qquad \cdots\cdots (A.6)$$

In the formula:

εm — Raw Coal Selection rate;

Qk — Volume of selected raw coal, measured in tons (t);

Qm — Volume of production raw coal, measured in tons (t).

A.7 Grade Equivalent

For mines recovering co-occurring and associated minerals through mineral processing, the grades of these components are first converted into equivalent grades using the price method. The equivalent grade is calculated using formula (A.7):

$$\alpha'_i = \alpha_i \cdot \frac{P_i}{P} \times 100\% \qquad \cdots\cdots (A.7)$$

In the formula:

α'i — The grade equivalent of the coexisting component i;

αi — The grade of the associated component i in the raw ore;

Pi — The price per unit of the co-occurring component i, measured in Yuan;

P — The price per unit of the main component, measured in Yuan.

A.8 Total Recovery of Associated and Coexisting Minerals Rate

Calculate the Total Recovery of Associated and Coexisting Minerals Rate using formula (A.8):

$$T_{Pk}^{v} = \frac{K \cdot \sum_{i=1}^{v} \varepsilon_i \cdot \alpha'_i}{\sum_{i=1}^{k} \alpha'_i} \times 100\% \qquad \cdots\cdots (A.8)$$

In the formula:

TvPk — The Total Recovery of Associated and Coexisting Minerals Rate of co-associated minerals when recovering v kinds of useful components from k kinds of co-associated minerals;

K — Mining Recovery Rate;

v — The number of co-occurring useful components recovered in each final product;

ε_i — The mineral processing recovery rate of the coexisting component i;

α'_i — The grade equivalent of the coexisting component i;

k — The number of useful components co-occurring in mineral resource reserves.

Appendix B
(Reference)
Examples of Green Mine Evaluation Indicators

Table B.1 presents examples of green mine evaluation indicators.

Table B.1 Green Mine Evaluation Indicators

Number	Level 1 indicator	Level 2 indicator	Level 3 indicator	Weight	Evaluation Requirements	Obligatory/ Improvable
1	Mining are environment	Mineral Appearance	Functional zone			
			Supporting facility			
			Signs			
			Fixed position management			
			Clean and hygienic			
		Greening and beatification of mining area	Greening of mining area			
			Greening effect			
2	Resource exploitation	Mining activities	Methods of mining			
			Technique of mining			
			Mining recovery rate			
		Mining face	Quality requirement			
3	Comprehensive utilization of resources	Mineral processing recovery	Mineral processing technique			
			Mineral processing			

			recovery rate			
		Comprehensive utilization of mineral resources	Comprehensive exploration and evaluation of associated resources			
			Comprehensive utilization rate of associated and co-occurring minerals			
			The protection of minerals that cannot be mined temporarily			
			Comprehensive utilization of products related to mineral processing			
		Comprehensive utilization of solid waste	Disposal and utilization of industrial solid waste			
			Recycle and extract valuable elements/useful minerals			
		Comprehensive utilization of	Utilization of production			

		wastewater	wastewater			
			Utilization of domestic wastewater			
4	Green and Low-carbon	Economical Intensive Land Use	Economical Intensive Land Use			
		Energy conservation and consumption reduction	Energy management system			
			Energy consumption per unit product			
		Reduce carbon emissions	Carbon emission accounting			
		Source prevention	Groundwater environmental conditions			
			Source prevention of acidic wastewater			
			Source prevention of soil pollution			
			Potential risks identification of soil pollution			
		Waste emissions	Solid waste emissions			
			Wastewater emissions			

			Exhaust emissions			
			Mobile source control			
			Noise emissions			
5	Ecological Remediation	Mine geological environment protection and land reclamation plan	Formulation and implementation of Mine geological environment protection and land reclamation plan			
			Provision and use of mine geological environment governance and restoration fund			
		Governance requirements	Governance effect			
		Dynamic monitoring of mine environment	Requirements of dynamic monitoring			
		Environment management system	Requirements of environment management system			
6	Scientific and Technological	Scientific and Technological	Investment in research and			

	Innovation and Standardized Management	Innovation	development and technique transformation			
			Innovative achievements			
		Digital Mine	Centralized control and management platform			
			Intelligent application			
		Standardized Management	Corporate culture			
			Corporate integrity			
			Harmonious between mine and local			

Appendix C
(Reference)
Technical Framework of Green Mine Evaluation Standard

C.1 Title

The green mine evaluation standards formulated by industries, localities or mines based on this document should standardize the title names. The name consists of two parts: the description of the scope of application and the description of the degree of standardization.

The scope of application in the name can be expressed as the name of an industry, a place or a mine, and it is advisable to use the name stipulated by law or recognized.

The expression of the degree of standardization in the name can be divided into two categories: Guidelines for Green Mine Evaluation and Requirements for Green Mine Evaluation. Among them, the guidelines for green mine evaluation are the guiding requirements for green mine evaluation. The content should include the characteristic requirements for green mine evaluation within the applicable scope, but it may not include specific evaluation index values. The requirements for green mine evaluation are detailed requirements for green mine evaluation and should include all relevant specific evaluation index values.

C.2 File Structure

The document structure of the green mine evaluation standards formulated by industries, localities or mines based on this document should be:

a) Scope;
b) Normative References Documents;
c) Terms and Definitions;
d) General Principles;
e) Evaluation Requirements:
  1) General Requirements,
  2) Mining,
  3) Resource Utilization,
  4) Green and Low-carbon,
  5) Ecological Remediation,
  6) Scientific and Technological Innovation and Standardized Management,
  7) Mineral Appearance;
f) Evaluation Procedure;
g) Evaluation Report;
h) Appendix: Green Mine Evaluation Indicators.

References

[1] GB/T 36132—2018 General Rules for Green Factory Evaluation

[2] GB/T 42249—2022 Technical Indicators for Comprehensive Utilization of Mineral Resources and Their Calculation Methods

[3] DZ/T 0312—2018 Green Mine Construction Specifications for Non-metallic Minerals Industry

[4] DZ/T 0313—2018 Green Mine Construction Specifications for the Chemical Industry

[5] DZ/T 0314—2018 Green Mine Construction Specifications for the Gold Industry

[6] DZ/T 0315—2018 Green Mine Construction Specifications for the Coal Industry

[7] DZ/T 0316—2018 Green Mine Construction Specifications for the Sandstone Industry

[8] DZ/T 0317—2018 Green Mine Construction Specifications for the Onshore Oil and Gas Extraction Industry

[9] DZ/T 0318—2018 Green Mine Construction Specifications for the Cement Limestone

[10] DZ/T 0319—2018 Green Mine Construction Specifications for the Metallurgical Industry

[11] DZ/T 0320—2018 Green Mine Construction Specifications forthe Nonferrous Metals Industry

[12] HJ446—2008 Clean Production Standard for Coal Mining and Preparation Industry

[13] Catalogue of Advanced and Applicable Technologies for Mineral Resources Conservation and Comprehensive Utilization (Announcement No.68 of 2022 of the Ministry of Natural Resources)