

Legal Disclaimer

This text is a non-official translation and has no legal effect. STRADE, Oeko-Institut and the European Commission do not assume any liability for its contents. The authentic versions of the relevant acts, including their preambles, are those published on the official website of the Ministry of Land and Resources of the People's Republic of China.

ICS 73.060

D 40

B 09

DZ

Standard of the Geology and Mineral Industry of the People's Republic of China

DZ/T XXXXX—
XXXX

Construction Specification of Green Mines of the Non-ferrous Metal Industry

Click here to add a logo that is consistent with
the international standard

(for approval)

Issued on XX-XX-XXXX

Implemented on XX-XX-XXXX

Issued by the Ministry of Land and Resources of People's Republic of China

non-official translation

Table of Contents

Introduction.....	III
1 Scope.....	1
2 Normative references.....	1
3 Terminology and definition.....	2
4 General principles.....	2
5 Environment of the mining area.....	2
5.1 Basic requirements.....	2
5.2 Appearance of the mine.....	2
5.3 Greening of the mining area.....	3
6 Resource development mode.....	3
6.1 Basic requirements.....	3
6.2 Green development.....	3
6.3 Technologies and equipments.....	3
6.4 Index requirements.....	4
6.5 Ecological environment protection of the mining area.....	4
7 Comprehensive utilization of resources.....	4
7.1 Basic requirements.....	4
7.2 Utilization of coexisted and associated resources.....	4
7.3 Treatment and utilization of solid waste.....	4
7.4 Utilization of wastewater and waste gas.....	5
8 Energy saving and emission reduction.....	5
8.1 Basic requirements.....	5
8.2 Energy consumption requirement for mining.....	5
8.3 Energy consumption requirement for separation.....	5
8.4 Control the sewage discharge.....	5
8.5 Control the solid waste discharge.....	6
9 Scientific and technological innovation and digital mine.....	6
9.1 Basic requirements.....	6
9.2 Scientific and technological innovation.....	6
9.3 Digital mine.....	6
10 Enterprise management and corporate image.....	6
10.1 Basic requirements.....	6
10.2 Corporate culture.....	6

10.3	Enterprise management.....	7
10.4	Enterprise credit.....	7
10.5	Harmony of enterprise and land.....	7
Appendix A (normative appendix) Reference values of the recovery rate of mining and the recovery rate of separation of some metals.....		8
AppendixB (informative appendix) The scale level of a non-ferrous metal mine.....		15
References.....		16

non-official translation

Introduction

This standard is drafted in accordance with the rules given by GB/T 1.1-2009.

This standard is put forward by Ministry of Land and Resources of the People's Republic of China.

This standard is centralized by the National Technical Committee for Standardization of Land and Resources (SAC/TC93).

Drafting units of this standard: China Nonferrous Metals Industry Association, Chinese Academy of Geological Sciences, CINF Engineering Corporation Limited, Beijing General Research Institute of Mining and Metallurgy, and Zhengzhou Institute of Comprehensive Utilization of Mineral Resources, Chinese Academy of Geological Sciences.

The main drafters of this standard: Zhang Nan, Duan Shaofu, Liu Fanglai, Chen Jianshuang, Liu Fuchun, Ma Jun, Peng Tao, Ju Jianhua, Wu Dengding, Hao Meiyong, Chu Kelei, Yu Bin, Hu Jianjun, Liu Quanmin, Cao Jincheng, Guo Min and Wu Peng.

Construction Specification of Green Mines of the Non-ferrous Metal Industry

1 Scope

This standard specifies the basic requirements for the environment of the mining area, the resource development mode, the comprehensive utilization of resources, energy saving and emission reduction, scientific and technological innovation and digital mine, enterprise management and enterprise image of green mines in the non-ferrous metal industry.

This standard applies to the construction of green mines of newly-built, reconstructed and expanded and production mines in the non-ferrous metal industry (copper mine, bauxite mine, lead-zinc mine, tungsten mine, molybdenum mine, stibnite mine, tin mine, nickel mine, magnesium mine, etc.).

2 Normative references

The following documents are essential for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including all modifications) applies.

GBZ 2.1-2007 Occupational exposure limits for hazardous agents in the workplace Part 1: Chemical hazardous agents

GBZ 2.2-2007 Occupational exposure limits for hazardous agents in the workplace Part 2: Physical factors

GB 12348 Emission standard for industrial enterprises noise at boundary

GB 12523 Emission standard of environment noise for boundary of construction site

GB/T 13306 Signs

GB 14161 Mine safety signs

GB 18598 Standard for pollution control on the security landfill site for hazardous wastes

GB 18599 Standard for pollution on the storage and disposal site for general industrial solid wastes

GB/T 19001 Quality management systems-Requirements

GB/T 23331 Energy management systems-Requirements

GB/T 24001 Environmental management systems- Requirements with guidance for use

GB 25465 Emission standard of pollutants for aluminum industry

GB 25466 Emission standard of pollutants for lead and zinc industry

GB 25467 Emission standard of pollutants for copper, nickel and cobalt industry

GB/T 28001 Occupational health and safety management systems-Requirements

GB 30770 Emission standards of pollutants for stannum, antimony and mercury Industries

GB 50187 Specification for general layout design of industrial enterprises

GB 50771 Code for design of nonferrous metal mining

GB 50421 Code for waste dump design of nonferrous metal mines

GB 50782 Code for technological design of non-ferrous concentrator

GB 50863 Code for design of tailings facilities

GB 50988 Code for design of environment protection engineering of nonferrous metals industry

GB 50595-2010 Code for energy conservation design of non-ferrous metal mines

HJ 651 Technical specification of eco-environmental protection and reclamation for mines (trial)

TD/T 1036 Quality control standard of land reclamation

3 Terminology and definition

The following terms and definitions are applicable to this document.

3.1

Green mine

non-official translation

In the whole process of development of mineral resources, the scientific and orderly mining is implemented, and the ecological environment disturbance in the mining area and its surrounding is controlled within the controllable range. The mine with an ecological environment, a scientific mining mode, the efficient utilization of resources, the digital management information and a harmonious community in the mining area is realized.

3.2

Green coverage rate of the mining area

The percentage of the greening area in the mining area in the area which can be greened within the boundary, including the waste rock yard, the industrial site in the mining area, and green belts on both sides of the mining area.

3.3

Input of R&D and technical innovation

The capital investment for an enterprise to carry out R&D and technical innovation activities. The R&D and technical innovation activities include scientific research and development, technology introduction, technological innovation, transformation and promotion, equipment renewal, scientific and technological training, information exchange, scientific and technological cooperation, etc.

4 General principles

4.1 A mine shall abide by national laws and regulations and related industrial policies, and run the mine according to law.

4.2 A mine shall carry out the development concept of innovation, coordination, greening, openness and sharing; follow the principle of adjusting measures to local conditions of the mine; and realize the overall consideration and comprehensive development of the utilization of resources, energy saving and emission reduction, environmental protection, land reclamation, corporate culture and enterprise and harmony of enterprise and land in the whole process of the development of mineral resources.

4.3 A mine shall be people-oriented, protect workers' health and prevent, control and eliminate occupational hazards.

4.4 A newly built, reconstructed or expanded mine shall be built according to this standard; a production mine shall be upgraded according to this standard; and the construction of green mines shall run through the whole process of design, construction, production and closing.

5 Environment of the mining area

5.1 Basic requirements

5.1.1 The layout of functional zonings of the mining area shall be reasonable; the mining area shall be greened and beautified, and the whole environment shall be clean and beautiful.

5.1.2 The site of the plant shall be selected reasonably. Tailings and dump sites shall be set on the site with a low permeability to prevent the pollution to groundwater. The design shall meet the requirements of GB 18599, GB 50988, GB 50863, GB 50421, GB 25465, the pollution control standard of hazardous waste storage and other provisions.

5.1.3 The management of production, transportation and storage shall be standardized and orderly.

5.2 Appearance of the mine

5.2.1 The mining area shall be divided into functional zones such as production area, management area, living area and ecological area. Each functional zone shall comply with the provisions of GB 50187; and the production, living, management and other functional zones shall have corresponding management institutions and management systems, orderly operation and standard management.

5.2.2 The ground transportation, water supply, power supply, health, environmental protection and other supporting facilities shall be complete in the mining area; in the production area, the operating signs, illustration signs, roadmap and other signs shall be set and comply with the provisions of GB/T 13306; and the safety signs shall be set in the areas requiring safety warning, such as road intersections, mouths of wells, mine pits and production workshops, and they shall comply with the provisions of GB 14161.

5.2.3 In the process of production, transportation and storage of a mine, the dust prevention and cleaning measures shall be taken. In the places where dust is produced, such as storage bins, crushers, vibrating screens,

and the material receiving point and unloading point of a belt conveyor, the closed measures shall be taken or mechanical dedusting, spraying dustfall and dust suppression by biological membrane shall be used.

The watering or spray dustfall shall be used for roads, working faces of the mining area and dumping sites. The dust concentration in the workplace shall meet the requirements of the allowable dust concentration specified in GBZ 2.1-2007.

5.2.4 The domestic sewage and the production wastewater in the mining area shall be separately collected and treated, and 100% of the sewage shall be discharged according to standard.

5.2.5 The reasonable and effective technical measures shall be adopted to de-noise the high-noise equipments. The limit of noise exposure in the workplace shall comply with the provisions of GBZ 2.2-2007. The limit of noise emission at the boundary of industrial enterprises shall comply with the provisions of GB 12348. The limit of noise emission at the boundary of construction sites shall comply with the provisions of GB 12523.

5.3 Greening of the mining area

5.3.1 The greening of the mining area shall be harmonious with the surrounding natural environment and landscape. The greening plants shall reasonably match, and the greening coverage rate of the mining area shall reach 100%.

5.3.2 The closed tailings pond and the waste dump of an open-pit mine shall be reclaimed and greened. Isolated green belts shall be set on both sides of the special road in the mining area according to local conditions.

6 Resource development mode

6.1 Basic requirements

6.1.1 The development of resources shall be harmonious with environmental protection, resource protection and urban and rural construction, and minimize disturbance and destruction to the natural environment. The resource-saving and environment-friendly development mode shall be chosen.

6.1.2 On the basis of "adhering to the principle of protection and rational exploitation and utilization", according to the occurrence conditions, geological conditions, ecological environment characteristics and other conditions of resources, the reasonable mining order and mining method shall be selected reasonably according to local conditions. The technologies and equipments with a high utilization rate of resources, a small amount of waste production, a high recycling rate of water, and less ecological destruction of the mining area are preferred. The requirements of clean production shall be met.

6.1.3 In the mining of the main mineral, the coexisted and associated minerals with the industrial value shall be planned together, mined comprehensively and utilized comprehensively. The waste shall be prevented. For the minerals which cannot be mined comprehensively or should be mined simultaneously but cannot be utilized comprehensively for the time being, the effective protection measures shall be taken.

6.1.4 The principle of "mining while managing and recovering" shall be followed, the geological environment of the mine shall be timely managed and restored, and the land occupied and destroyed by the mine shall be reclaimed.

6.2 Green development

6.2.1 The core of mine production is the efficient development and recycling of resources. Through technological innovation and optimization of the process, the minimization of environmental disturbance and the optimization of ecological reengineering shall be realized in the process of mining, separation and smelting.

6.2.2 The requirements of the mining process are as follows:

a) In the open-pit mining, the integrated technology of stripping-dumping-land making-reclamation; in the underground mining, mining by filling and the mining technology reducing surface subsidence shall be adopted; in an oxidized mine, the combined exploitation of mining separation and smelting shall be adopted according to local conditions, the process and technology which integrate mining separation and smelting or directly obtain metals from the deposits shall be developed; and in the Hydraulic mining, the mining technology with a high recycling rate of water shall be popularized.

b) The full tailings backfill technology is suitable for underground mines with conditions, so as to realize the mining without waste.

c) In the area with complex hydrogeology, the filling materials must be treated harmlessly in advance.

6.2.3 The requirements of the separation process are as follows:

a) The separation process and product plan adopted shall be made on the basis of the sufficient separation test, and the main metals and associated elements shall be fully utilized.

b) For complex refractory ores, the innovative technology shall be adopted to reduce energy consumption, and improve technical and economic indexes, or the combined process of separation and smelting shall be adopted. The method of mercury mixing is prohibited for gold separation.

c) The separation agents with a high efficiency, low toxicity and little environmental impact shall be selected for the separation process. Ventilation facilities shall be set in the workshops producing harmful gases, and the cyaniding agent room shall be isolated separately and closed completely.

6.3 Technologies and equipments

6.3.1 The high-efficiency mining method and the high concentration or paste filling technology shall be selected for underground mining, and the trackless mechanized mining shall be realized.

6.3.2 In an open-pit mine, the mechanized equipments for mining, stripping, transporting and discharging with a high degree of automation shall be adopted.

6.3.3 The large-scale, highly efficient and energy-saving technologies and equipments shall be adopted by a dressing plant.

6.3.4 100% of production equipments of a large mine shall be mechanized.

6.4 Index requirements

The mining recovery rate and the separation recovery rate of copper, aluminum, lead, zinc, tungsten, molybdenum, tin, antimony, nickel and other mines shall meet the requirements of Appendix A. The separation recovery rate of aggregate lead and zinc ores with complex dissemination characteristics difficult to separate can be adjusted according to the actual situation. The mining recovery rate and the separation recovery rate of other non-ferrous metal mines shall meet the relevant requirements of the minimum index of "three rates" promulgated by the Ministry of Land and Resources.

6.5 Ecological environment protection of the mining area

6.5.1 Environmental control and land reclamation shall be carried out in accordance with the geological environment protection and land reclamation plan of the mine. The specific requirements are as follows:

a) The protection and restoration of the ecological environment such as mine dump, open pit, special roads in the mining area, industrial site of the mine, subsidence area, tailings ponds and other contaminated sites of the mine shall comply with the provisions of HJ 651;

b) The land occupied and damaged by a closed pit (mining area) and closed tailings shall be reclaimed within three years, and the quality of land reclamation shall comply with the provisions of TD/T 1036.

c) If the surface subsidence is temporarily difficult to deal with, effective measures shall be taken to minimize the negative effects on the environment.

d) After the geological environment treatment, all kinds of sites of the mine shall be safe and stable, have no threat to human and animal plants; cause no pollution to the surrounding environment; be harmonious with the surrounding natural environment and landscape; restore the basic functions of the land, realize the sustainable use of land according to local conditions; and recover and protect the whole ecological function of the region.

e) The control degree of geological environment of a mine and the land reclamation rate shall meet the requirements of the geological environment protection and land reclamation plan for the registered mine.

6.5.2 An environmental monitoring and disaster emergency warning mechanism shall be established, specialized institutions shall be set up, and there shall be full-time management and monitoring personnel. The specific requirements are as follows:

a) The pollution sources and pollutants such as mineral separation wastewater, tailings, waste dumps, waste stone quarries, dust of the mining area and noise shall be dynamically monitored

b) A real-time monitoring system for ground pressure, slope and tailings dam of the mine shall be

established to prevent mine disasters.

c) During and after mining, the long-term monitoring mechanism shall be established and improved, and the stability and effect of land reclamation areas shall be dynamically monitored.

7 Comprehensive utilization of resources

7.1 Basic requirements

The coexisted and associated mineral resources shall be comprehensively developed and utilized; in accordance with the principle of reduction, recycling and reuse, the solid wastes, wastewater and others shall be scientifically used to develop the recycling economy.

7.2 Utilization of coexisted and associated resources

7.2.1 The comprehensive exploration, comprehensive evaluation and comprehensive development shall be made on the coexisted and associated resources.

7.2.2 The advanced, applicable, economic and reasonable process and technology shall be selected for the comprehensive recovery and utilization of coexisted associated resources. The utilization of copper-associated molybdenum, copper-associated gold, molybdenum-associated tungsten, lead and zinc associated silver, lead and zinc associated antimony, bauxite-associated gallium, associated lithium resources of tantalum and niobium, and low-grade polymetallic symbiotic ore shall be maximized. The comprehensive utilization rate of the coexisted and associated minerals shall be meet "the requirements for the minimum index of three rates" for non-ferrous metal mines promulgated by the Ministry of Land and Resources.

7.2.3 In a newly-built, reconstructed and expanded mine, the utilization project of coexisted and associated resources shall be designed, constructed and put into product simultaneously with the mining, separation and smelting project of the main mineral; and if they cannot be constructed or put into production at the same time, the conditions of the mining, separation and smelting project shall be reserved.

7.3 Treatment and utilization of solid waste

7.3.1 The stacking of waste stones and tailings shall comply with the relevant regulations. The tailings pond of Class II general industrial solid wastes shall meet the requirements of environmental protection and seepage prevention; the tailings pond of hazardous wastes shall be disposed of safely according to the relevant provisions of GB 18598 and other hazardous wastes. The disposal rate of solid wastes such as waste rocks and tailings in a mine shall be 100%.

7.3.2 The tailings transportation system shall set the collection facilities under the accident condition, and the accident facilities shall meet the requirements of GB 50863.

7.3.3 And enterprise shall recycle the useful components in waste rocks and tailings, extract and utilize dilute metals in the tailings, and complete the resource utilization such as backfilling, road building and building material making for waste rocks and tailings.

7.4 Utilization of wastewater and waste gas

7.4.1 The advanced water-saving technology shall be adopted, and the standardized and complete drainage system and necessary water treatment facilities shall be built in the mining area.

7.4.2 The clean and resourceful technology and process shall be used to dispose of mine water and separation wastewater rationally with a total disposal rate of 100%.

7.4.3 The mine water shall be made full use of; the wastewater from separation shall be recycled, and the recycling rate of separation wastewater shall be not lower than 85%, or zero discharge shall be realized.

7.4.4 An exhaust gas purification device shall be set when the exhaust pollutants generated in the mining and separation process exceed the emission standard. The purified gas shall meet the discharge standard.

8 Energy saving and emission reduction

8.1 Basic requirements

The system of energy consumption accounting in the whole process of production of a mine shall be established. By taking measures of energy saving and emission reduction, the energy consumption, material consumption and water consumption of the unit products shall be controlled and reduced, and the emission of “three wastes” shall be reduced.

8.2 Energy consumption requirement for mining

8.2.1 Through comprehensive evaluation of resources, energy consumption, economy, environment and other factors, the mining method shall be determined reasonably and the energy consumption of mining shall be reduced. New technology, new technology and new equipment for energy saving and consumption reduction shall be adopted to reduce energy consumption in mining.

8.2.2 The comprehensive energy consumption index of mining of a large non-ferrous metal mine shall meet the requirement of Level 2 energy consumption index specified in 3.3, 3.4 and 3.5 of GB 50595-2010. The energy consumption index of a medium and small-sized mine shall not be lower than the Level 3 energy consumption index specified in 3.3, 3.4 and 3.5 of GB 50595-2010.

8.3 Energy consumption requirement for separation

8.3.1 The principle of "more crushing and less grinding, collecting early and losing early" shall be followed. The process of separation shall be determined reasonably, the production efficiency shall be improved and the energy consumption of separation shall be reduced. The advanced technology shall be used to implement the automatic testing and monitoring in the process of separation, ensure the operation of equipment in the best state, fully play the equipment efficiency and achieve the purpose of energy saving and consumption reduction.

8.3.2 The comprehensive energy consumption index of a large non-ferrous metal mine shall meet the requirement for Level 2 energy consumption index in 4.3 of GB 50595-2010, and the energy consumption index of a medium and small-sized mine shall not be lower than the Level 3 energy consumption index specified in 4.3 of GB 50595-2010.

8.4 Control the sewage discharge

8.4.1 The sewage treatment system shall be established in the mining area to realize the rainwater diversion and the clean-up diversion.

8.4.2 The intercepting drain (drainage channel) shall be built in tailings ponds and waste dumps.(waste stone quarries). The leaching water shall be recycled after treatment or discharged according to the standard.

8.4.3 The heavy metal pollution sources shall be controlled, and the pollution of lead, cadmium, arsenic, mercury, chromium and other harmful heavy metals shall be prevented and controlled. The automatic monitoring system shall be set in the source area of heavy metal pollution sources. Copper, nickel, cobalt, lead, zinc, tin, antimony, mercury and other heavy non-ferrous metal mines shall meet the requirements of GB 25467, GB 25466 and GB 30770. In the major pollution prevention and control areas of heavy metal, especially in the areas with an emission limit, the emission amount of major heavy metal pollutants shall meet the relevant requirements.

8.5 Control the solid waste discharge

8.5.1 The mining and separation technology and process shall be optimized, the comprehensive utilization of resources shall be strengthened, and the amount of solid wastes produced such as waste rocks shall be reduced.

8.5.2 Solid wastes from a mine shall be used as filling materials, building materials, secondary utilization materials, etc.

8.5.3 The surface soil stripped from an open-pit mine shall be piled up separately for reclamation.

9 Scientific and technological innovation and digital mine

9.1 Basic requirements

9.1.1 A technical R&D team shall be established, the transformation of scientific and technological

achievements shall be promoted, the technological transformation shall be intensified, and the upgrading of the green industry shall be promoted.

9.1.2 A digital mine shall be built. The informationization of production, operation and management of the mining enterprise shall be realized.

9.2 Scientific and technological innovation

9.2.1 The scientific and technological innovation system with the enterprise as the main body and market orientation combining production, teaching and research shall be established.

9.2.2 The specialized scientific and technological personnel shall be recruited to research the key technologies which support the development of the main business of the enterprise and improve the level of process in the efficient development of resources, the comprehensive utilization of resources and other aspects.

9.2.3 The investment in R&D and technical innovation shall be no less than 1.5% of the main business income of the previous year.

9.3 Digital mine

9.3.1 The automation system of mine production shall be built, and the centralized control and information linkage of subsystems such as production and monitoring shall be realized.

9.3.2 The digital resource reserve model and economic model shall be established, the dynamic management and economic evaluation of mineral resources reserves shall be carried out, and the precision management of the reserves utilization of geological and mineral resources shall be realized.

9.3.3 The safety monitoring and control system shall be established to ensure the safety in production.

9.3.4 The mechanized reduction of personnel and the automatic substitution shall be promoted. The mining mechanization and the automation of the separation and smelting process shall be realized. The rate of numerical control of key production processes shall not be lower than 70%.

9.3.5 The computer, intelligent control and other technologies shall be used to build the intelligent mine and realize the deep integration of informatization and industrialization.

10 Enterprise management and corporate image

10.1 Basic requirements

10.1.1 The enterprise management system of property rights, responsibilities, management, culture and other aspects shall be established.

10.1.2 The quality management system, environmental management system and occupational health and safety management system shall be established to ensure the management of quality, environment, occupational health and safety.

10.2 Corporate culture

10.2.1 The core values of the enterprise of people orientation, innovative learning, standard behaviors, high efficiency and safety, ecological civilization and green development shall be established. The enterprise spirit of unity and struggle, optimism, innovation, pragmatic entrepreneurship and advancement shall be cultivated.

10.2.2 The vision of enterprise development shall be consistent with the goal pursued by all the staffs. The long-term development strategy of the enterprise and the personal value of employees shall be closely integrated.

10.2.3 The trade union organization shall be improved, and it shall play an effective role. The staffs' material, sports and cultural life shall be enriched. The satisfaction of the employees of the enterprise shall not less than 70%. The occupational health inspection rate of workers exposed to occupational hazards shall not be less than 90% during their work.

10.2.4 The mechanism of synchronous growth of employees' income with the performance of the enterprise shall be established.

10.3 Enterprise management

10.3.1 The rules and regulations for resource management, ecological environment protection, safety production, occupational disease prevention and control and others shall be established. The working mechanism shall be defined and the duties shall be fulfilled.

10.3.2 All kinds of statements, standing books and archival data shall be complete.

10.3.3 The staff training system shall be established. The training plan and the training records shall be clear.

10.4 Enterprise credit

10.4.1 The production and operation activities and the performance of social responsibilities must be honest and trustworthy. The mining right owner shall fulfill the obligation to publicize the information about prospecting and mining, and relevant information shall be publicized.

10.4.2 Relevant information shall be disclosed on the company's website and other locations accessible by the public, mainly including:

a) the environmental impact report and reply for the establishment of the enterprise and subsequent construction projects;

b) monitoring and emission data of pollutants such as wastewater, dust and noise;

c) the contact information of the responsible department for the safety production and environmental protection of the enterprise.

10.5 Harmony of enterprise and land

10.5.1 The mining concept of construction of the enterprise and land, sharing of interests and common development shall be established. A long-term cooperative mechanism shall be built by creating a community development platform. The resources and advantages of different parties shall be given full play to, and a multi-cooperative model of win-win for the social management of the mining area shall be established.

10.5.2 The investigation mechanism of mass satisfaction in the mining area shall be established. Support shall be provided in the aspect of education, employment, transportation, life and environmental protection. The quality of people's life in the mining area shall be improved, and the harmony of enterprise and land shall be promoted.

10.5.3 The mechanism of consultation and negotiation with the township and town (street) and village (community) of a mine shall be established, all kinds of interest disputes shall be handled in a proper and timely manner, and there shall be no major group event.

Appendix A (normative appendix)

Reference values of the recovery rate of mining and the recovery rate of separation of some metals

The requirements for the mining recovery rate and the separation recovery rate of a copper mine are shown in Table A1 and A2.

Table A.1 Requirements for the index
of the mining recovery rate of copper
mine

Unit: %

Open-pit mining

Large mine		95	
Small and medium-sized mines or mines whose shapes of ore bodies vary greatly, ore bodies are thin and ore rocks have poor stability		92	
Underground mining			
Thickness of the ore body	Copper (equivalent) grade $\geq 1.2\%$	Copper (equivalent) grade $0.60\% \sim 1.2\%$	Copper (equivalent) grade $\leq 0.60\%$
$\leq 5\text{m}$	88	80	75
$5 \sim 15\text{m}$	92	83	80
$\geq 15\text{m}$	92	85	85

Table A.2 Requirements for the index of the separation recovery rate of copper mine

Unit: %

Ore type	Structure type	Grade and granularity	Grade and granularity	Grade and granularity	Grade and granularity
		Copper grade of sulfide ore ≥ 1 Copper grade of mixed ore ≥ 1.5 Copper grade of oxidized ore ≥ 3	$0.6 \leq$ Copper grade of sulfide ore < 1 $1 \leq$ Copper grade of mixed ore < 1.5 $1.5 \leq$ Copper grade of oxidized ore < 3	$0.4 \leq$ Copper grade of sulfide ore < 0.6 $0.6 \leq$ Copper grade of mixed ore < 1 $1 \leq$ Copper grade of oxidized ore < 1.5	Copper grade of sulfide ore < 0.4 Copper grade of mixed ore < 0.6 Copper grade of oxidized ore < 1

		Coarse and medium- grained	Fine- grained	Micro- fine- grained	Coarse and medium- grained	Fine- grained	Micro- fine- grained	Coarse and medium- grained	Fine- grained	Micro- fine- grained	Coarse and medium- grained	Fine- grained	Micro- fine- grained
Sulfide ore	Massive and granular structure	90.0	87.5	86.0	88.5	86.0	84.0	86.5	84.0	82.0	83.0	80.5	79.0
	Banded structure	89.5	86.5	85.0	87.5	85.0	83.0	86.0	83.0	81.5	82.0	80.0	78.0
	Stratiform- like and spiderweb structure	87.5	85.0	83.0	86.0	83.0	81.5	84.0	81.5	80.0	80.5	78.0	76.5
	Disseminat- ed and metasomar- ic structure	86.5	84.0	82.0	85.0	82.5	80.5	83.0	80.5	79.0	79.5	77.5	76.0
Mixed ore	Massive and granular structure	87.0	84.5	83.0	85.5	83.0	81.0	83.5	81.0	79.5	80.0	77.5	76.0
	Banded structure	86.0	83.5	82.0	84.5	82.0	80.0	83.0	80.0	78.5	79.0	77.0	75.5

	Stratiform-like and spiderweb structure	84.5	82.0	80.0	83.0	80.0	78.5	81.0	78.5	77.0	77.5	75.5	74.0
--	---	------	------	------	------	------	------	------	------	------	------	------	------

non-official translation

	Disseminated and metasomatic structure	83.5	81.0	80.0	82.0	79.5	77.9	80.0	77.9	76.0	77.0	74.5	73.0
Oxidized ore	Massive and granular structure	78.5	76.0	74.5	77.0	74.5	73.0	75.0	73.0	71.5	72.0	70.0	68.5
	Banded structure	77.5	75.0	74.0	76.0	74.0	72.0	74.5	72.0	71.0	71.5	69.0	68.0
	Stratiform-like and spiderweb structure	76.0	74.0	72.0	74.5	72.0	71.0	73.0	70.8	69.5	70.0	68.0	66.5
	Disseminated and metasomatic structure	75.0	73.0	71.5	74.0	71.5	70.0	72.0	70.0	68.5	69.0	67.0	66.0

Note: Table A.1 and A.2 are quoted from *Requirements of the Minimum Index of "Three Rates" for the Rational Exploitation and Utilization of Copper Mine Resources (Trial)*.

The requirements for the mining recovery rate and the separation recovery rate of a lead mine and a zinc mine are shown in Table A3, A4 and A5.

Table A.3 Requirements for the index of the mining recovery rate of lead mine and zinc mine

Open-pit mining		Unit: %
Large mine	95	
Small and medium-sized mines or mines whose shapes of ore bodies vary greatly, ore bodies are thin and ore rocks have poor stability	92	

Underground mining									
Thickness of the ore body	Lead and zinc (equivalent) grade (sulfide ore)			Lead and zinc (equivalent) grade (mixed ore)			Lead and zinc (equivalent) grade (oxidized ore)		
	≥9.0%	4.5%~9.0%	≤4.5%	≥11.5%	6.0%~11.5%	≤6.0%	≥14.0%	7.5%~14.0%	≤7.5%
≤5m	88	80	75	88	80	75	88	80	75
5~15m	92	83	80	92	83	80	92	83	80
≥15m	92	85	85	92	85	85	92	85	85

Table A.4 Requirements for the index of the separation recovery rate of lead mine

Unit: %												
Ore type	Structure type	Grade and granularity			Grade and granularity			Grade and granularity			Grade and granularity	
		Lead grade of sulfide ore ≥3 Lead grade of mixed ore ≥3.6 Lead grade of oxidized ore ≥5			1.5 ≤ Lead grade of sulfide ore < 3 2.5 ≤ Lead grade of mixed ore < 3.6 3 ≤ Lead grade of oxidized ore < 5			0.5 ≤ Lead grade of sulfide ore ≤ 1.5 1.0 ≤ Lead grade of mixed ore < 2.5 1.5 ≤ Lead grade of oxidized ore < 3			Lead grade of sulfide ore < 0.5 Lead grade of mixed ore < 1.0 Lead grade of oxidized ore < 1.5	
		Coarse and medium-grained	Fine-grained	Micro-fine-grained	Coarse and medium-grained	Fine-grained	Micro-fine-grained	Coarse and medium-grained	Fine-grained	Micro-fine-grained	Coarse and medium-grained	Fine-grained

Sul fid e ore	Massive and granular structure	93.0	90.0	88.0	91.0	88.0	86.5	89.0	86.5	84.5	85.0	83.0	81.0
	Banded structure	92.0	89.0	87.0	90.0	87.0	85.5	88.0	85.5	84.0	84.5	82.0	80.0
	Stratiform- like and spiderweb structure	90.0	87.0	85.5	88.0	85.5	84.0	86.5	84.0	82.0	83.0	80.0	78.5
	Disseminate d and metasomarc structure	89.0	86.5	84.5	87.0	84.5	83.0	85.5	83.0	81.0	82.0	79.5	78.0
Mi xe d ore	Massive and granular structure	90.0	87.5	85.5	88.5	85.5	84.0	86.5	84.0	82.0	83.0	80.5	79.0
	Banded structure	89.0	86.5	85.0	87.5	85.0	83.0	85.5	83.0	81.5	82.0	79.5	78.0
	Stratiform- like and spiderweb structure	87.5	85.0	83.0	85.5	83.0	81.5	84.0	81.5	80.0	80.5	78.0	76.5
	Disseminate d and metasomarc structure	86.5	84.0	82.0	85.0	82.0	80.5	83.0	80.5	79.0	79.5	77.0	75.5

Oxidized ore	Massive and granular structure	81.0	78.5	77.0	79.5	77.0	75.5	78.0	75.5	74.0	74.5	72.5	71.0
	Banded structure	80.5	78.0	76.0	79.0	76.5	75.0	77.0	75.0	73.0	74.0	71.5	70.0
	Stratiform-like and spiderweb structure	78.5	76.5	75.0	77.0	75.0	73.0	75.5	73.0	72.0	72.5	70.0	69.0
	Disseminated and metasomatic structure	78.0	75.5	74.0	76.5	74.0	72.5	75.0	72.5	71.0	71.5	69.5	68.0

Table A.5 Requirements for the index of the separation recovery rate of zinc mine

Unit: %

Ore type	Structure type	Grade and granularity			Grade and granularity			Grade and granularity			Grade and granularity		
		Zinc grade of sulfide ore ≥ 5			$3 \leq$ Zinc grade of sulfide ore < 5			$1 \leq$ Zinc grade of sulfide ore < 3			Zinc grade of sulfide ore < 1		
		Zinc grade of mixed ore ≥ 5.5			$3.5 \leq$ Zinc grade of mixed ore < 5.5			$1.5 \leq$ Zinc grade of mixed ore < 3.5			Zinc grade of mixed ore < 1.5		
		Zinc grade of oxidized ore ≥ 7			$5 \leq$ Zinc grade of oxidized ore < 7			$3 \leq$ Zinc grade of oxidized ore < 5			Zinc grade of oxidized ore < 3		
		Coarse and medium-grained	Fine-grained	Micro-fine-grained	Coarse and medium-grained	Fine-grained	Micro-fine-grained	Coarse and medium-grained	Fine-grained	Micro-fine-grained	Coarse and medium-grained	Fine-grained	Micro-fine-grained
Sulfide ore	Massive and granular structure	91.0	88.0	84.0	89.0	86.5	84.5	87.0	84.5	83.0	83.5	81.0	79.5
	Banded structure	90.0	87.5	83.0	88.0	85.5	84.0	86.5	84.0	82.0	83.0	80.5	78.5
	Stratiform-like and spiderweb structure	88.0	85.5	81.0	86.5	84.0	82.0	84.5	82.0	80.5	81.0	79.0	77.0

	Disseminated and metasomatic structure	87.0	84.5	80.5	85.5	83.0	81.0	84.0	81.0	79.5	80.5	78.0	76.0
Mixed ore	Massive and granular structure	89.0	86.0	82.0	87.0	84.5	82.5	85.0	82.5	81.0	81.5	79.0	77.5
	Banded structure	88.0	85.0	81.0	86.0	83.5	82.0	84.5	82.0	80.0	81.0	78.5	77.0
	Stratiform-like and spiderweb structure	86.0	83.5	79.5	84.5	82.0	80.0	82.5	80.0	78.5	79.0	77.0	75.0
	Disseminated and metasomatic structure	85.0	82.5	78.5	83.5	81.0	79.5	82.0	79.5	77.5	78.5	76.0	74.5
Oxidized ore	Massive and granular structure	81.0	78.5	75.0	79.5	77.0	75.5	78.0	75.5	74.0	74.5	72.5	71.0
	Banded structure	80.5	78.0	74.0	79.0	76.5	75.0	77.0	75.0	73.0	74.0	71.5	70.0
	Stratiform-like and spiderweb structure	78.5	76.5	72.5	77.0	75.0	73.0	75.5	73.0	72.0	72.5	70.0	69.0
	Disseminated and metasomatic structure	78.0	75.5	72.0	76.5	74.0	72.5	75.0	72.5	71.0	71.5	69.5	68.0

Note: Table A.3, A.4 and A.5 are quoted from *Requirements of the Minimum Index of "Three Rates" for the Rational Exploitation and Utilization of Copper Mine Resources (Trial)*.

The requirements for the mining recovery rate and the separation recovery rate of a bauxite mine are shown in Table A6 and A7.

Table A.6 Requirements for the index
of the mining recovery rate of bauxite
mine

Open-pit mining (%)
92
Underground mining

Thickness of ore body (m)	$A/S \geq 10$	$10 > A/S > 5$	$A/S \leq 5$
$H \geq 5$	88	80	75
$5 > H > 2$	80	75	72
$H \leq 2$	75	72	70

Table A.7 Requirements for the index of the separation recovery rate of bauxite mine

Unit: %

Ore type	Alumina-silica ratio	Separation recovery rate	Remarks
Stacking type		95	Required rate of mud content $\leq 3.0\%$
Sedimentary type	$A/S \geq 5$	80	The enrichment ratio is required to reach 1.8 and the ratio of aluminum to silicon in tailings shall be lower than 1.5.
	$5 > A/S > 3$	76	
	$A/S \leq 3$	72	

The requirements for the mining recovery rate and the separation recovery rate of a tungsten mine are shown in Table A8 and A9.

Table A.8 Requirements for the index of the mining recovery rate of tungsten mine

Open-pit mining (%)	
92	
Underground mining	
Geological grade ($WO_3, \%$)	Index requirement

$WO_3 \leq 0.2$	80
$0.2 < WO_3 \leq 0.4$	85
$WO_3 > 0.4$	90

Table A.9 Requirements for the index of the separation recovery rate of tungsten mine

Ore type	Disseminated grain size (mm)	Separated ore grade (%)		
		$WO_3 < 0.2$	$0.2 \leq WO_3 < 0.4$	$WO_3 \geq 0.4$
Wolframite (wolframite phase $\geq 90\%$)	≥ 0.2	75	80	82
	< 0.2	70	72	81
Scheelite (scheelite phase $\geq 90\%$)	≥ 0.2	70	74	76
	< 0.2	68	71	72
Mixed ore (either wolframite or scheelite)	≥ 0.2	59	62	64

phase > 10%)	<0.2	56	60	62
--------------	------	----	----	----

The requirements for the mining recovery rate and the separation recovery rate of a molybdenum mine are shown in Table A10 and A11.

Table A.10 Requirements for the index of the mining recovery rate of molybdenum mine

Open-pit mining (%)			
Large mine			95
Small and medium-sized mines or mines whose shapes of ore bodies vary greatly, ore bodies are thin and ore rocks have poor stability			92
Underground mining			
Thickness of ore body (m)	Molybdenum grade (%)		
	≥ 0.2	$0.2 \sim 0.1$	≤ 0.1
$H \leq 5$	88	80	75
$5 < H < 15$	90	83	80
$H \geq 15$	92	85	85

Table A.11 Requirements for the index of the separation recovery rate of molybdenum mine

Structural type	Separated grade (α , %)					
	$\alpha \leq 0.06$	$0.06 < \alpha \leq 0.08$	$0.08 < \alpha \leq 0.10$	$0.10 < \alpha \leq 0.20$	$0.20 < \alpha \leq 0.50$	$\alpha > 0.50$
Massive and granular	80.5	81.5	86	88	92.5	93.5
Strip	80	81	85	87	92	93
Stratiform-like and spiderweb	79.5	80.5	84	86	91	92

XX/T XXXXX—XXXX						
Stratiform-like and spiderweb	79	80	83	85	90	91

Note: Table A.6-11 is quoted from *Requirements of the Minimum Index of "Three Rates" for the Rational Exploitation and Utilization of Mineral Resources Such as Manganese, Chromium, Bauxite, Tungsten, Molybdenum, Pyrite, Graphite and Asbestos (Trial)*.

The requirements for the mining recovery rate and the separation recovery rate of a nickel mine are shown in Table A12, A13 and A14.

Table A.12 Requirements for the index of the recovery rate of open-pit mining of nickel mine

Open-pit mining (%)	
Open-pit mine	92
Open-pit mine whose ore bodies have complex shapes	88

Table A.13 Requirements for the minimum index of the recovery rate of underground mining of nickel mine

Ore grade (%)		Requirement of the recovery rate index (%)	
Primary ore	Other ores	The thickness of the ore body $\leq 5\text{m}$	The thickness of the ore body $> 5\text{m}$
≤ 0.5	≤ 1.2	75	80
0.5-0.8	1.2-2.0	85	88
≥ 0.8	≥ 2.0	88	92

Table A.14 Requirements for the minimum index of the separation recovery rate of nickel mine

Ore grade (%)	Requirement for the recovery rate index (%)	
	Medium ores which can be separated	Complex refractory ores
≤ 0.7	68	55
0.7-1.0	73	62
≥ 1.0	82	72

The requirements for the mining recovery rate and the separation recovery rate of a tin mine are shown in Table A15, A16 and A17.

Table A.15 Requirements for the index of the recovery rate of open-pit mining of tin mine

Open-pit mining (%)	
Open-pit mine	95

Mines whose shapes of ore bodies vary greatly, ore bodies are thin and rocks have poor stability	92
--	----

Table A.16 Requirements for the index of the recovery rate of underground mining of tin mine

Ore grade (%)	Requirement of the recovery rate index (%)	
	The thickness of the ore body $\leq 5\text{m}$	The thickness of the ore body $> 5\text{m}$
≤ 0.4	78	80
0.4-0.8	80	85
≥ 0.8	88	90

Table A.17 Requirements for the minimum index of the separation recovery rate of tin mine

Ore grade (%)	Requirement of the recovery rate index (%)	
	Medium ores which can be separated	Complex refractory ores
≤ 0.4	62	50
0.4-0.8	70	60
≥ 0.8	80	65

The requirements for the mining recovery rate and the separation recovery rate of an antimony mine are shown in A18, A19 and A20.

Table A.18 Requirements for the index of the recovery rate of open-pit mining of antimony mine

Open-pit mining (%)	
Open-pit mine	95
Mines whose shapes of ore bodies vary greatly, ore bodies are thin and ore rocks have poor stability	92

Table A.19 Requirements for the minimum index of the recovery rate of underground mining of antimony mine

Ore grade (%)	Requirement of the recovery rate index (%)	
	The thickness of the ore body $\leq 5\text{m}$	The thickness of the ore body $> 5\text{m}$
≤ 1.5	75	80
1.5-2.5	77	85
≥ 2.5	80	90

Table A.20 Requirements for the minimum index of the separation recovery rate of

antimony mine

Ore grade (%)	Requirement of the recovery rate index (%)	
	Medium ores which can be separated	Complex refractory ores
≤ 1.5	75	60
1.5-2.5	82	65
≥ 2.5	90	75

Note: Table A.12-20 is quoted from *Requirements of the Minimum Index of "Three Rates" for the Rational Exploitation and Utilization of Mineral Resources Such as Nickel, Tin, Antimony, Gypsum and Talc (Trial)*.

Appendix B
(informative appendix)
The scale level of a non-ferrous metal mine

Type of mine	Scale level of mine production and construction			
	Measurement unit / year	Large	Medium-sized	Small
Copper	Ten thousand tons of ores	≥ 100	100~30	< 30
Lead	Ten thousand tons of ores	≥ 100	100~30	< 30
Zinc	Ten thousand tons of ores	≥ 100	100~30	< 30
Tungsten	Ten thousand tons of ores	≥ 100	100~30	< 30
Tin	Ten thousand tons of ores	≥ 100	100~30	< 30
Antimony	Ten thousand tons of ores	≥ 100	100~30	< 30
Bauxite	Ten thousand tons of ores	≥ 100	100~30	< 30
Molybdenum	Ten thousand tons of ores	≥ 100	100~30	< 30
Nickel	Ten thousand tons of ores	≥ 100	100~30	< 30

Cobalt	Ten thousand tons of ores	≥ 100	100~30	< 30
Magnesium	Ten thousand tons of ores	≥ 100	100~30	< 30
Bismuth	Ten thousand tons of ores	≥ 100	100~30	< 30
Mercury	Ten thousand tons of ores	≥ 100	100~30	< 30

References

- [1] Requirements for the construction of green mines in the non-ferrous metal industry (Ministry of Land and Resources)
 - [2] Specification of green mines in Huzhou
 - [3] Guide for the advanced and applicable technology of energy saving and emission reduction in the non-ferrous metal industry
 - [4] Compilation of statistics of the non-ferrous metal industry from 2010 to 2015
 - [5] The development report of the non-ferrous metal from 2010 to 2016
 - [6] Minimum index requirements for the “three rates” of copper, lead, zinc, nickel, bauxite, tin, antimony, tungsten, etc.
-