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Construction Specification of Green Mines of the Non-metallic Minerals Industry

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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 Non-Metallic Minerals Industry Association, Chinese Academy of Geological Sciences and Zhengzhou Institute of Comprehensive Utilization of Mineral Resources, Chinese Academy of Geological Sciences.

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Construction Specification of Green Mines of the Non-metallic Minerals 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-metallic minerals industry (graphite, fluorite, talc, kaolin, bentonite, diatomite, sepiolite, attapulgite, illite, vermiculite, refractory clay, gypsum, asbestos, wollastonite, barite, feldspar, pyrophyllite, perlite, mica, zeolite, siliceous material, andalusite, etc.).

This standard applies to the construction of green mines of newly-built, reconstructed and expanded and production mines in the non-metallic minerals industry.

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 Occupational exposure limits for hazardous agents in the workplace: Chemical hazardous agents
GB 3095 Ambient air quality standards
GB 8978 Integrated wastewater discharge standard
GB 12348 Emission standard for industrial enterprises noise at boundary
GB/T 13306 Signs
GB 14161 Mine safety signs
GB 16297 Integrated emission standard of air pollutants
GB 16423 Safety regulations for metal and nonmetal mines
GB 18599 Standard for pollution on the storage and disposal site for general industrial solid wastes
GB 50187 Specification for general layout design of industrial enterprises
GB 51016 Technical code for non-coal open-pit mine slope engineering
HJ 651 Technical specification of eco-environmental protection and reclamation for mines (trial)
TD/T 1036 Quality control standard for land reclamation

3 Terminology and definition

The following terms and definitions are applicable to this document.

3.1

Green mine

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 and scientific and technological cooperation.

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 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; the production, living, management and other functional zones shall have corresponding management institutions and management systems, order operation and standard management.

5.2.2 The ground roads, 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 marks shall be set in the areas requiring safety warning, and the safety sign shall comply with the provisions of GB 14161.

5.2.3 A mine shall take measures such as spray, watering, wet rock drilling and dust collection device to dispose of the dust produced in the process of mining, separation and transportation. The allowable concentration of dust in the air in the workplace shall comply with the provisions of GBZ 2.1.

5.2.4 The solid wastes such as mine tailings and waste rocks shall have special storage and disposal places. Their construction, operation, supervision and management shall comply with the provisions of GB 18599.

5.2.5 A mine shall carry out the sewage discharge and diversion, and the discharge of sewage shall comply with the provisions of GB 8978.

5.2.6 A mine shall be equipped with waste gas treatment facilities, and the gas discharge shall comply with the provisions of GB 3095 and GB 16297.

5.2.7 A mine shall take measures such as noise reduction, vibration damping and vibration isolation to reduce the noise produced in the process of mining, separation and transportation. The limit of ambient noise emission within the boundary shall comply with the provisions of GB 12348.

5.3 Greening of the mining area

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%.

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 According to the existing conditions of non-metallic mineral resources, characteristics of the ecological environment and other conditions, the reasonable mining sequence and mining method shall be selected according to local conditions. A mine shall give preference to the advanced equipment, technology and process encouraged, supported and promoted by the state which have a high utilization rate of resources, a small amount of waste production, a high recycling rate of water and little ecological destruction in the mining area, and fully realize the utilization by classification, high-quality utilization and comprehensive utilization of resources.

6.1.3 The principle of "mining while managing and recovering" shall be followed, and the geological environment of the mine shall be timely managed and restored, and the land occupied and destroyed by the mine shall be reclaimed. The management rate and the reclamation rate of the land occupied and destroyed by the mine shall meet the requirements of the geological environment protection and land reclamation plan of the mine.

6.2 Green development

6.2.1 The safety technologies in the process of mining shall comply with the provisions of GB 16423.

6.2.2 For the open-pit mining, the technology of peeling-dumping-mining-land creation-reclamation shall be adopted. The design, investigation, stability evaluation, monitoring and control of an open-pit slope project shall comply with the provisions of GB 51016. In the underground mining, according to geological conditions such as ores and surrounding rocks, combined with technical conditions of the mine and economic factors, a reasonable technology shall be chosen to reduce surface subsidence.

6.2.3 For a mine involving the separation process, the separation process shall be developed on the basis of the separation test, the recovery rate of the main mineral and coexisted and associated minerals shall be improved, and the protection and rational utilization of the resources shall be promoted.

6.2.4 The indexes of exploitation and utilization of mineral resources shall comply with the local industrial policies, admittance conditions of the industry and other provisions. The mining recovery rate, the recovery rate of separation and the comprehensive utilization ratio of some types of mines shall meet the minimum index requirement of "three rates" announced and published by the Ministry of Land and Resources, as shown in Appendix A.

6.3 Ecological environment protection and restoration

6.3.1 In accordance with the geological environment protection and land reclamation scheme of the mine, the responsibility mechanism shall be set up. The management, reclamation, production and construction activities shall be deployed and implemented together, the annual plan shall be made, and the geological environment management and land reclamation shall be completed in a timely manner. The specific requirements are as follows:

a）The protection and restoration of the ecological environment such as mine dump, open pit, industrial site, subsidence area and contaminated site shall comply with the provisions of HJ 651.

b）The quality of land reclamation of a mine shall comply with the provisions of TD/T 1036.

c）All kinds of sites after the recovery and management of a mine shall be safe and stable, shall not pollute the surrounding environment, and shall be harmonious with the surrounding natural environment and landscape. The recovered land of the mine shall have basic functions, the sustainable utilization of land shall be realized according to local conditions, and the overall ecological function of the region shall be protected and restored.

6.3.2 An environmental monitoring mechanism shall be established, and there shall be management personnel

and monitoring personnel. The specific requirements are as follows:

a）A mine shall dynamically monitor the separation wastewater, tailings, dumps, waste rock yards, dust, noise and so on, disclose the data to the society and accept the supervision of the public.

b）During and after the mining, the long-term monitoring mechanism shall be established and improved, and the stability of the geological environment and the quality of soil in the land reclamation area and the affected scope in the mining area shall be monitored dynamically.

7 Comprehensive utilization of resources

7.1 Basic requirements

In accordance with the principle of reduction, recycling and reuse, coexisted and associated mineral resources shall be comprehensively developed and utilized. The solid wastes such as waste rocks and tailings and the separation waste water shall be used in a scientific and rational way.

7.2 Utilization of coexisted and associated resources

7.2.1 According to needs of the economic and social development and the actual situation of the mineral deposit, the comprehensive exploration, comprehensive evaluation and comprehensive development shall be made on the coexisted and associated resources.

7.2.2 The coexisted and associated resources with the economic use value shall be recycled with an advanced, appropriate, economical and reasonable technological process. The relationship between social, economic and environmental benefits shall be properly handled.

7.3 Utilization of solid waste

7.3.1 A mine shall carry out backfilling, road building, production of building materials and other comprehensive utilization of resources for waste rocks, tailings and other solid wastes.

7.3.2 The disposal rate of solid wastes such as waste rocks and tailings shall be 100%.

7.4 Utilization of mineral separation wastewater

7.4.1 The mine water and the mineral separation wastewater shall be disposed of by a clean and resourceful technology and process.

7.4.2 The recycling rate of the mineral separation wastewater of a mine shall not be lower than 85%.

8 Energy saving and emission reduction

8.1 Basic requirements

A mine shall establish the system of energy consumption accounting in the whole process of production, take measures of energy saving and emission reduction, control and reduce the energy consumption, material consumption and water consumption of the unit products, and reduce the emission of pollutants.

8.2 Energy saving and consumption reduction

8.2.1 The energy consumption accounting system for the whole process of production shall be established. The energy consumption of the mining of mineral resources, the comprehensive energy consumption of products and other relevant indexes shall comply with provisions about the design of a mine, the local industrial policies, the admittance conditions of the industry, etc.

8.2.2 A mine shall make use of new technology, new process, new equipments and new materials with high efficiency and energy saving, and eliminate the processes and equipments with high energy consumption, high pollution and a low efficiency in a timely manner. It shall make use of clean energy, such as solar energy and geothermal energy.

8.3 Pollutant discharge

8.3.1 A mine shall take effective measures to reduce the discharge of pollutants such as dust, noise, waste water, waste gas, waste rocks and tailings.

9 Scientific and technological innovation and digital mine

9.1 Basic requirements

9.1.1 The building of the R&D and scientific research team shall be attached importance to, the transformation of scientific and technological achievements shall be promoted, the technological transformation shall be intensified, and the green upgrading of the 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 A mine shall carry out the research on key technologies and improve the technological level in resource development, comprehensive utilization of resources, environmental protection, energy conservation and emission reduction, 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 safety monitoring and control system shall be established to ensure the safety in production.
9.3.2 The mechanized reduction of personnel and the automatic substitution shall be promoted. The mining mechanization and the automation of the mineral separation technology shall be realized. The numerical control rate of key production processes shall not be lower than 70%.
9.3.3 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.

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 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 Business 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) the monitoring and emission data of dust, waste water, exhaust gas, noise and other pollutants;

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 mining areas 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)
Requirements for the "three rate" index of some mines

A.1 See Table A.1 for the requirements for the "three rate" index of some mines

Table A.1 Requirements for the "three rate" index of some mines

Mineral name	Recovery rate of mining		Recovery rate of mineral separation	Comprehensive utilization ratio
	Open-pit mining	Underground mining		
Kaolin	≥85%	≥75%	≥85%	The comprehensive utilization ratio of tailings ≥98 %
Fluorite	≥90%	Stable rock mass[1]≥80%	Easily separated ore[2]≥83%	-
		Unstable rock mass[1]≥73%	Refractory ore[2]≥75%	
Graphite	≥92%	≥75%	Crystalline graphite[3]≥80%	-

Asbestos	≥90%	≥75%	≥85%	-
Gypsum	≥90%	The adoption of the room and pillar method≥35%	-	-
		The adoption of the caving method≥60%		
		The adoption of the full filling method≥85%		
Talc	≥85%	≥72%	The content of talc[4]≥50%, yield of the product[5]≥90%	-
			The content of talc[4]≥35%, yield of the product≥75%	
			The content of talc[4]＜35%, yield of the product≥40%	
Barite	≥90%	≥85%	Easily separated ore[6]≥90%	The comprehensive utilization ratio of coexisted and associated minerals[7]≥75%
			Refractory ore[6]≥80%	
Perlite	≥92%	-	Yield of the product≥75%	The comprehensive utilization ratio of tailings ≥90 %

Note 1: According to the quality grading standard of engineering rock mass (GB50218-94), Level I, II and III are stable rock masses, and Level IV and V are unstable rock masses.

Note 2: The separability of fluorite ore depends mainly on the structure of ore, and the type and embedding characteristics of coexisted and associated minerals. It usually contains impurities such as quartz, calcite and barite. The ore with complex composition or the ore whose disseminated grain size is smaller than 38μm is refractory ore. Note 3: The separation is not required for aphanitic graphite, and the recovery rate index of separation shall not be accessed.

Note 4: The content of talc in the selected raw ore.

Note 5: Some minerals, such as talc and perlite, are generally not separated, and the yield of products can be used instead of the recovery rate of separation. The yield of product refers to the percentage of the mass of the final product processed and produced and the mass of the original ores consumed.

Note 6: The separability of barite ore mainly depends on the structure of ores, and the type and characteristics of coexisted and associated minerals. Usually, the ore whose structure is simple and coexisted and associated minerals are single is called the easily separated ore. The ore whose structure is complex with mineral components such as quartz, calcite and fluorite is called the refractory ore.

Note 7: If the coexisted and associated mineral is fluorite and the content is above 20%, the comprehensive recovery is required, and the comprehensive utilization rate of the coexisted and associated mineral shall not be lower than 75%.

The above indexes are selected from Reference 6-10.

References

[1] *The Guiding Opinions on Implementing the National Mineral Resources Planning, Developing the Green Mining and Constructing Green Mines* and Guo Tu Zi Gui [2017] No. 4 *Implementation Opinions on Accelerating the Construction of Green Mines of Six Ministries and Commissions* (Guo Tu Zi Fa [2010] No. 119)

[2] *The Implementation Opinions on Accelerating the Construction of Green Mines of Ministry of Land and Resources, Ministry of Finance, Ministry of Environmental Protection, General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China, China Banking Regulatory Commission and China Securities Regulatory Commission* (Guo Tu Zi Gui [2017] No. 4)

[3] *The Technical Catalogue for Encouragement, Restriction and Elimination about the Saving and the Comprehensive Utilization of Mineral Resources of the Ministry of Land and Resources (Revised Edition)* (Guo Tu Zi Fa [2014] No. 176)

[4] *The Guidance Catalogue of Industrial Restructuring (2013)* (National Development and Reform Commission)

[5] *The National Development and Utilization Plan of Mineral Resources (2016-2020)* (Ministry of Land and Resources)

[6] *The Announcement of the Ministry of Land and Resources about the "Three Rate" Index for the Rational Exploitation and Utilization of Kaolin Mineral Resources* (Trial) (2012 No. 28)

[7] *The Announcement of the Ministry of Land and Resources about the Requirements of the Minimum "Three Rate" Index for the Rational Exploitation and Utilization of Mineral Resources, Such as Iron, Copper, Lead, Zinc, Rare Earth, Sylvite and Fluorite (Trial)* (2013 No. 21)

[8] *The Announcement of the Ministry of Land and Resources about the Requirements of the Minimum "Three Rate" Index for the Rational Exploitation and Utilization of Mineral Resources, Such as Manganese, Chromium, Bauxite, Tungsten, Molybdenum, Pyrite, Graphite and Asbestos (Trial)* (2014 No. 31)

[9] *The Announcement of the Ministry of Land and Resources about the Requirements of the Minimum "Three Rate" Index for the Rational Exploitation and Utilization of Mineral Resources, Such as Nickel, Tin, Antimony, Gypsum and Talc (Trial)* (2015 No. 30)

[10] *The Announcement of the Ministry of Land and Resources about the Requirements of the Minimum "Three Rate" Index for the Rational Exploitation and Utilization of Mineral Resources, Such as Lithium, Strontium, Barite, Limestone, Magnesite and Boron (Trial)* (2016 No. 30)