

## Foreword

According to the requirements of Document JIANBIAO [2013]No.169 issued by the Ministry of Housing and Urban-Rural Development (MOHURD) of the People's Republic of China—"Notice on Printing and Distributing 'the Development and Revision Plan of National Engineering Construction Standards in 2014'", this standard is jointly compiled by Hefei Design and Research Institute of Coal Industry and CCTEG Beijing Huayu Engineering Co.,Ltd. in collaboration with relevant organizations.

During the preparation process, the drafting group of this standard has carefully analyzed, summarized and absorbed the practical experiences of the development of mine automation and information construction in recent years through extensive investigation and research, and has widely solicited opinions, paid attention to the connection with relevant standards, and finalized the draft after review.

The standard consists of 7 chapters, covering: general provisions, terms, basic requirements, information infrastructures, mine production system, mine management system and information security.

The Ministry of Housing and Urban-Rural Development of the People's Republic of China is in charge of administration of this standard, China Coal Construction Association is in charge of the daily management, and Hefei Design and Research Institute of Coal Industry is in charge of the explanation of specific technical contents. All relevant organizations are kindly requested to sum up and accumulate your experiences in actual practices during the process of implementing this standard. The relevant opinions and advice, whenever necessary, can be fed back to Hefei Design and Research Institute of Coal Industry (Address: No.355 Fuyang North Road, Hefei City, Anhui Province, Postcode: 230041, Telephone: 0551-65602101, Fax: 0551-65856618, Email: htj5602117@sina.com) for reference in the revision.

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## 1 General provisions

**1.0.1** In order to standardize the design of intelligent mine and improve the level of intelligent mine technology, this standard is formulated.

**1.0.2** This standard is applicable to the feasibility study, preliminary design and construction drawing design of new, rebuilt and expanded intelligent mine in coal industry.

**1.0.3** Intelligent mine shall be designed in accordance with national and local policies, combined with factors such as resource development condition of mine, safety factor, human resources, enterprise demand, and promotion of technical progress.

**1.0.4** The design of an intelligent mine shall be advanced in technology, safe and efficient, applicable in function, reasonable in economy, and shall have expansibility, openness and flexibility.

**1.0.5** The design of an intelligent mine shall not only comply with this standard, but also comply with the provisions of current relevant national standards.

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## 2 Terms

### 2.0.1 Intelligent mine

Aiming at safety, efficiency, environmental protection and health, advanced measurement and control, information and communication technologies are used to collect, analyze and process mine safety production and management information, so as to realize the mine that can operate cooperatively and provide decision support.

### 2.0.2 Mine monitoring and automation platform

The collection of hardware and software required to realize the monitoring of mine production systems.

### 2.0.3 Mine information management platform

The collection of hardware and software required to realize mine safety, production, and management informatization.

### 2.0.4 One-stop portal

The unique entrance of mine information system to provide an unified user and authority management mechanism.

### 3 Basic requirements

**3.0.1** The equipment of each intelligent mine system shall have the function of fault diagnosis and realize the integrated early warning and forecast.

**3.0.2** The main production system of intelligent mine shall be automated and unattended.

**3.0.3** Intelligent mine should adopt the Internet of things, big data, cloud computing, mobile Internet and other advanced technological means to realize intelligence, information fusion, data mining and decision support.

**3.0.4** Intelligent mine shall establish information security system to realize system security, network security and application security.

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## 4 Information infrastructures

### 4.1 Overall architecture

**4.1.1** The overall architecture of intelligent mine shall include mine monitoring and automation platform and mine information management platform.

**4.1.2** The mine monitoring and automation platform shall be able to realize centralized monitoring of mine production system and meet the needs of mine information management platform for data collection, planning and management.

**4.1.3** The mine information management platform shall be able to process production operation and production management data, form a unified data integration platform, conduct dynamic scheduling and planning, and realize integrated command and decision support of mine production.

### 4.2 Transmission network

**4.2.1** The mine monitoring and automation platform network and mine information management platform network shall be designed as a whole in accordance with the principle of integration.

**4.2.2** The mine monitoring and automation platform network shall be composed of core layer, surface access layer and underground access layer.

**4.2.3** The mine information management platform network shall include core layer and surface access layer, and the convergence layer can be set according to actual needs.

**4.2.4** The mine monitoring and automation platform network shall meet the following provisions:

1 Backbone network shall adopt wired network transmission technology to realize information transmission.

2 Backbone network shall adopt an industrial Ethernet or a network compatible with Ethernet protocol.

3 Backbone network shall adopt industrial-grade equipment.

4 Backbone network shall support multiple network topologies and redundancy modes, and the network fault reconstruction time shall not exceed 50ms.

5 When active network is used as backbone network, ring or dual ring topology should be adopted.

6 When passive optical network is used as backbone network, dual bus or dual ring topology should be adopted.

7 Transmission rate of backbone network shall not be lower than 1000Mbps.

8 Branch network may adopt industrial Ethernet, field bus or wireless network.

**4.2.5** The information management platform network shall meet the following provisions:

1 Network of Ethernet technology should be adopted.

2 Transmission rate of backbone network shall not be lower than 1000Mbps.

3 Wireless network shall cover the office area and living area on the mine surface.

4 The mine information management network may adopt single network or dual network design according to the actual needs of the mine.

5 The outlet bandwidth of mine information management network should not be lower than

100Mbps.

**4.2.6** The mine monitoring and automation platform network shall not only comply with the provisions of this standard, but also comply with the relevant provisions of the current national industrial standards MT/T 1131 *Ethernet for a Coal Mine* and MT/T 1130 *Field-Bus for a Coal Mine*.

### **4.3 Platform hardware**

**4.3.1** The server shall meet the following requirements:

1 The server should include database server, acquisition server, application server, WEB publish server, extranet server, backup server, anti-virus server and so on.

2 Database servers, acquisition servers, and important application servers shall adopt redundant configuration.

**4.3.2** The workstation shall meet the following requirements:

1 The mine monitoring and automation system shall adopt industrial control computer.

2 Industrial control computer may adopt redundant configuration.

**4.3.3** Transmission equipment of mine monitoring and automation network shall meet the following provisions:

1 The core layer equipment shall adopt the three-layer industrial Ethernet switch or optical line terminal equipment with expansion capability. The core layer equipment shall adopt redundant configuration.

2 The access equipment should adopt modular industrial Ethernet switch or optical network unit. It should support the industrial field bus protocols such as CAN and PROFIBUS, and have interfaces such as RS-485/232.

3 The equipment shall support protocols such as EtherNet/IP, Profinet or ModbusTCP.

4 The equipment shall support VLAN, Simple Network Management Protocol (SNMP), and remote maintenance and management.

5 The backup ports of the equipment shall not be less than 30% of the total used, and no less than 3.

**4.3.4** Transmission equipment of mine information management network shall meet the following provisions:

1 The core layer equipment should adopt the three-layer Ethernet switch or optical line terminal equipment with expansion capability. The quantity shall not be less than 2, and the configuration such as dual computer hot-standby or load balancing shall be carried out.

2 When the core layer equipment uses single host configuration, the main components shall adopt redundant configuration.

3 The access layer equipment shall adopt 10/100/1000Mbps adaptive Ethernet switches or optical network units.

4 It shall be able to support VLAN, SNMP, and remote maintenance and management.

5 The backup ports of the equipment shall not be less than 30% of the total used, and no less than 3.

**4.3.5** The equipment interface shall meet the following provisions:

1 The Ethernet interface based on standard TCP/IP protocol shall be used for networking between equipment.

2 The 1000Mbps and above interfaces should be used for interconnection between switches, servers and storage equipment.

3 The interface between the core switch and the routing equipment of mine information management platform should be selected according to the access to the external network.

4 The monitoring system of a mine production system may be connected with the access layer equipment of mine monitoring and automation network through Ethernet port, serial interface or conversion interface.

**4.3.6** Storage equipment shall meet the following provisions:

1 The capacity of the image information storage system of mine video monitoring shall not be less than 30 days of accumulated information, and the capacity of other information storage systems shall not be less than 1 year of accumulated information.

2 The equipment shall be able to support dual controllers and hot swap, and adopt RAID. The equipment should support RAID0, RAID1, RAID5, RAID10 etc.

3 The equipment shall be able to support general storage management software, which can be configured, defined, and modified through the software.

**4.3.7** The mine network switching equipment shall not only comply with the provisions of this standard, but also comply with the relevant provisions of the current national industrial standard MT/T 1081 *Network Switch for a Coal Mine*.

#### **4.4 Platform software**

**4.4.1** The platform software shall be composed of mine monitoring and automation platform software, mine information management platform software and basic software.

**4.4.2** The mine monitoring and automation platform software shall include all kinds of monitoring software of mine production system. The monitoring software should use general configuration software.

**4.4.3** The mine information management platform software shall include one-stop portal management, mine safety management system, mine production management system, mine management system, decision support and other software.

**4.4.4** Basic software should include data acquisition software, database software, geographic information software, operating system software, virtualization software, network management software and anti-virus software.

#### **4.5 Data center**

**4.5.1** The data center shall be able to realize data fusion, data analysis and data classification, and realize the information interaction, sharing and physical isolation between the mine monitoring and automation platform and the mine information management platform.

**4.5.2** The main equipment of the data center shall meet the following requirements:

1 The mine monitoring and automation platform and the mine information management platform shall be equipped with servers, switches, storage systems, workstations and other equipment, and be managed separately.

2 Technologies such as virtualization, clustering and load balancing shall be adopted to improve the utilization and availability of equipment resources.

3 The backup system shall be established, and the disaster recovery function should be equipped.

**4.5.3** The data center should be set according to the cloud computing architecture, and all equipment



shall meet the requirements of running in the cloud environment.

**4.5.4** The data center shall not only comply with the provisions of this standard, but also comply with the relevant provisions of the current national standard GB 50174 *Code for Design of Data Centers*.

#### **4.6 Dispatch monitoring center**

**4.6.1** The dispatch monitoring center shall have the functions of dispatching command and remote monitoring of the mine production system, so as to display, alarm and record information such as mine safety production and dispatching management, and realize the video monitoring of important places in the mine as well.

**4.6.2** The dispatch monitoring center should be set in the joint architecture, central office building or special building related to mine production.

**4.6.3** The dispatch monitoring center may be divided into dispatching area, monitoring area, meeting area and management area according to the function division.

**4.6.4** The dispatch monitoring center shall not only comply with the provisions of this standard, but also comply with the relevant provisions of the current national standards GB 51024 *Code for Design of Intelligent Monitoring and Control System of Coal Mine Safety Production* and GB 50174 *Code for Design of Data Centers*.

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## **5 Mine production system**

### **5.1 General requirements**

**5.1.1** The technology and equipment of a mine production system shall be designed according to the requirement of realizing intelligence.

**5.1.2** Each mine production system shall have the functions of collecting, analyzing and storing the production and process parameters, equipment status, run time and other information, and shall set up relevant testing equipment and software to meet the requirements of energy consumption and capacity analysis, fault diagnosis and environmental protection.

**5.1.3** The monitoring equipment, communication network interface and communication protocol of each production system should be unified.

**5.1.4** Each production system shall be equipped with audio and video monitoring and communication systems, and the unattended system shall be linked with audio and video monitoring.

**5.1.5** The associated production system shall be able to realize linkage control, adjustment and early warning.

### **5.2 Coal-mining face and development heading system**

**5.2.1** It shall be determined the intelligent covering range and quality for a mining face and development heading according to the mining technology, equipment used and other related conditions, and the working face with few people or unmanned work face should be considered for realization.

**5.2.2** The coal-mining face equipment shall meet the following requirements:

**1** The shearer shall have functions such as operating condition and pose parameter monitoring, airborne wireless remote control, drum cutting path memory, remote control and fault diagnosis, and shall be able to provide a control interface to a third party.

**2** The hydraulic support shall be equipped with the electrohydraulic control system, and it shall be able to follow the shearer to automatically implement various actions such as stretching and shortening for wall support, advancing support, pushing conveyor, and dust-depressing. It shall have remote control function and should be accommodated with the emulsion supply system.

**3** The scraper conveyor shall have the functions of soft-start control, running condition monitoring, automatic tension of tail chain, fault diagnosis, and communication with face control system and automatic control. It should have the function of coal flow load detection and cooperative control.

**4** The emulsion pump shall have the function of flow regulation. It shall be able to realize high pressure automatic back-washing, automatic proportioning and fluid infusion, and automatic control of high-low liquid level, and realize the concentration monitoring of emulsion.

**5** The face equipment shall realize centralized, local and remote control, and realize the cooperative control and process start-stop of the shearer, hydraulic support and scraper.

**5.2.3** The equipment in a development heading shall meet the following requirements:

**1** The heading machine of fully mechanized excavation face shall have remote control, and positioning and cutting functions.

- 2 The fully mechanized excavation equipment should realize centralized control.

### **5.3 Ventilation and safety system**

**5.3.1** The ventilation system shall meet the following requirements:

- 1 The system shall be able to monitor the operation and state parameters of the whole mine ventilation network, and realize the united computation of the air volume, wind speed, ventilation resistance and wind temperature of the mine ventilation network, and the working condition simulation calculation of the main ventilator. The working conditions and process energy consumption of the main ventilator shall be monitored online.

- 2 The main ventilator shall have the function of automatic stepless regulation. Various air doors should realize automatic control and remote control functions.

- 3 The normal start, air reversing and ventilator switching of the main ventilator shall realize one-button operation. The main ventilator room should be unattended.

- 4 The local ventilator shall have the function of speed regulation and should be controlled centrally on the ground.

**5.3.2** The mine safety monitoring system shall meet the following requirements:

- 1 The system shall realize self-diagnosis and self-evaluation, and shall have data analysis and application functions.

- 2 The safety monitoring system shall be linked with information guidance and release, communication, personnel location and other systems.

- 3 Digital signal transmission shall be adopted between various sensors and sub-stations. Gas sensor should use laser sensor and other full-range sensors. The air return corner of the working face should adopt wireless sensor. The sensors shall have self-diagnosis function.

**5.3.3** The mine shall be provided with the dust monitoring system for the coal face and coal flow transport system, and the operating parameters of the fire sprinkler system shall be monitored.

**5.3.4** The mine pressure monitoring system shall be set up in the mine to monitor the displacement, stress distribution and flexible range of the coal face and the roof and surrounding rock of the roadway affected by mining. The dangerous events of the roof and rock burst shall be predicted and alarmed.

**5.3.5** The coal and gas outburst monitoring system shall meet the following requirements:

- 1 The coal and gas outburst mine shall set up the coal and gas outburst monitoring system, and shall have the functions of early warning of outburst hazards and automatic alarm of accidents during disasters.

- 2 The mine safety monitoring system shall be connected.

**5.3.6** The gas extraction system shall meet the following requirements:

- 1 The gas extraction system shall be controlled centrally. The operating parameters of the upper and lower pipelines of mine and the extraction pump shall be monitored online. The stop-start and rotation of the extraction pump may realize one-button operation.

- 2 For the mine with large changes in gas emission parameter in different periods, the extraction pump should carry out speed adjusting operation.

- 3 The gas extraction pipeline shall be equipped with the automatic water discharge device.

**5.3.7** The mine hydrologic monitoring system shall meet the following requirements:

- 1 For mountainous areas, areas with more developed surface water system and areas with more severe waterlogging, the surface water, rainfall, mine water inflow and observation points of

underground water disaster shall be monitored, and alarm should be given when the underground hydrogeology is abnormal.

2 Dynamic monitoring groundwater and early warning of flooding disaster shall be carried out in mines with complex and extremely complex hydrogeological category, long-term observation shall be made on water level, water volume, water temperature and water quality of main aquifers and water inrush points.

**5.3.8** The underground drainage system shall meet the following requirements:

1 The underground drainage system should be linked with the mine hydrologic monitoring system.

2 The underground drainage system shall be monitored centrally on the ground. The underground dewatering pump rooms shall be unattended.

3 The main drainage system should automatically choose a reasonable drainage method according to the rational utilization of water resources, peak-valley electricity load, electricity price and other factors.

4 The process energy consumption of the main drainage system shall be monitored online.

**5.3.9** The underground personnel management system shall realize the accurate positioning of mine personnel, and it shall be connected with the information guidance and release system and the communication system. Personnel positioning card and mine lamp shall be integrated.

**5.3.10** The fire-fighting system shall meet the following requirements:

1 The mine shall be equipped with the underground fire automatic monitoring system to monitor the environmental parameters of critical areas such as mined-out stope, roadway and working face in real-time online, and real-time warning shall be given according to the change trend.

2 The grouting station and nitrogen production station shall be equipped with the monitoring system to monitor the running status of equipment and pipelines in real time. The nitrogen production station shall be unattended.

## **5.4 Hoisting and transportation system**

**5.4.1** The main hoisting and transportation system shall be centrally controlled and unattended.

**5.4.2** The main hoisting and transportation system shall automatically analyze and adjust working state according to the production information of each link, so that the production efficiency, equipment usage and energy consumption of the system can operate on the optimal state.

**5.4.3** The mine with separate mining and transportation shall measure the output of each coal type.

**5.4.4** The equipment selection and system design of the auxiliary hoisting and transport system shall improve the application level of automation and continuity.

**5.4.5** The auxiliary transportation system shall monitor and analyze the haulage vehicles and traffic conditions, and implement intelligent logistics scheduling and distribution according to the production demand.

**5.4.6** The transportation system shall select new technology, new process and new equipment reasonably and reliably.

## **5.5 Auxiliary production system**

**5.5.1** Mine auxiliary production system includes heating system (including central air-conditioning system of industrial site), refrigeration and cooling system, gas utilization system, water supply system, drainage system, sewage treatment system, mine water treatment system and compressed air system. Its intelligent level shall meet the functional configuration requirements in Table 5.5.1.

Table 5.5.1 Intelligent functional configuration of auxiliary production system

Name of auxiliary system	Functional configuration						
	User service target management	Load regulation and pipe network distribution	Measurement and energy consumption analysis	Automatic operation and unattended management	Fault analysis, diagnosis and early warning	Product quality management in production process	Government environmental protection department liaison management
Heating system (including central air-conditioning of industrial site)	Coal-fired heating boiler room	●	●	○	●	-	●
	Other heat (air conditioning) sources	-	●	●	●	-	-
	Heat supply (air conditioning) network	-	●	●	●	-	-
	Heat (air conditioning) user	●	●	◎	●	◎	-
Underground refrigeration and cooling system	Refrigeration station	-	●	●	●	-	-
	Refrigerant pipe network	-	●	●	●	-	-
	Cooling face	●	●	●	●	-	-
	Gas source	-	●	◎	●	●	-
Gas utilization system	Transmission and distribution system	-	●	●	●	-	-
	Utilization equipment	-	●	●	●	-	-
	Water source	●	●	●	●	●	○
	Water supply pipe network	◎	●	-	●	●	-
Water supply system	Daily pump room/Disinfection system	●	●	●	●	●	-
	Soft water and cooling water supply	●	●	●	●	●	-
	Fire fighting water supply	◎	-	○	●	●	-
	Underground fire sprinkling	◎	●	●	●	●	-
Drainage system	Sewage/rainwater pipe network	◎	-	-	●	-	-
	Sewage/rainwater pump room	●	●	●	●	-	○
Wastewater treatment system	Pre-treatment system	-	●	●	●	●	-
	Water treatment system	-	●	●	●	●	-

Table 5.5.1 (continued)

Name of auxiliary system	Functional configuration							Government environmental protection department liaison management
	User service target management	Load regulation and pipe network distribution	Measurement and energy consumption analysis	Automatic operation and unattended management	Fault analysis, diagnosis and early warning	Product quality management in production process		
Wastewater treatment system	Advanced treatment system	●	●	●	●	●	●	-
	Disinfection system	-	●	●	●	●	●	-
	Sludge treatment	-	●	●	●	●	●	-
	Water inlet and outlet online equipment	-	●	●	●	●	●	●
	Wastewater reuse system	●	●	●	●	●	●	◎
Mine water treatment system	Underground drainage and ground control system	-	●	●	●	●	●	-
	Dosing system	-	●	●	●	●	●	-
	Coagulation and sedimentation	-	●	●	●	●	●	-
	Filtering system	-	●	●	●	●	●	-
	Advanced treatment system	-	●	●	●	●	●	-
Compressed air system	Disinfection system	-	●	●	●	●	●	-
	Mud treatment system	-	●	●	●	●	●	-
	Reuse and efflux system	●	●	●	●	●	●	●
	Compressed air station	-	●	●	●	●	●	-
	Compressed air pipe network	-	◎	-	●	●	●	-
Compressed air user	◎	-	◎	-	-	-	-	

- Notes: 1 User service target management—refers to the management system that automatically starts and stops or adjusts the user system with the user design parameter as the control target.  
 2 Load regulation and pipe network distribution—refers to the control and management system that can automatically issue regulation or distribution commands to the pipe network and sources according to the information of user management system.  
 3 Fault analysis and diagnosis and early warning shall include safety monitoring and early warning functions.  
 4 "●"—shall be configured, "◎"—should be configured, "○"—may be configured, "-"—no requirement.  
 5 The intelligent function of the water treatment system in the heating boiler room shall be configured according to the requirements of soft water system in the water supply system in this table.

**5.5.2** The functional configuration shall not be duplicated with other intelligent systems. When the information required for functional configuration can be introduced from other intelligent systems and meets the requirements of this control function, the method of introducing information shall be adopted. When the information of other intelligent systems does not meet the system function requirements, the information acquisition device shall be configured.

**5.5.3** The industrial video monitoring system shall meet the following requirements:

- 1 The digital system shall be used.
- 2 The system configuration shall meet the requirements of intelligent mine production system, and the important monitoring points shall be able to realize video detection and video recognition.
- 3 The transmission network of video monitoring system should be set independently.

**5.5.4** Surface buildings and public security shall be implemented in accordance with the relevant provisions of current national standards, such as GB 50314 *Standard for Design of Intelligent Building*, GB 50116 *Code for Design of Automatic Fire Alarm System* and GB 50348 *Technical Code for Engineering of Security and Protection System*.

## **5.6 Power supply and distribution system**

**5.6.1** The mine shall be equipped with the intelligent power monitoring and dispatching system, and shall meet the following requirements:

- 1 It shall be capable of real-time monitoring and power dispatching for the main substation of mine and the substation of workshops at all levels, and should be individually networked.
- 2 It shall have the function of uploading monitoring data to the mine dispatching center and the data uploading function that meets the requirement of the superior power department.
- 3 It shall have the functions of peak-valley electric energy measurement, energy consumption statistical analysis, power quality monitoring and so on.
- 4 It shall have the functions of data acquisition, operation monitoring, intelligent alarm, fault recording, fault analysis, source maintenance, data identification and so on.
- 5 It shall be able to automatically generate operation orders that meet the regulations and standards, and realize the sequence control function of intelligent high-voltage switchgear.
- 6 The power supply system shall have the functions of adaptive relay protection and automatic optimal control when operating in different modes.
- 7 The high voltage system with multi-level power distribution on the mine surface and underground should be equipped with intelligent anti-override trip protection.

**5.6.2** The mine substation at all levels should meet the following requirements:

- 1 The main substation of mine shall be designed according to intelligence, and the substation of workshops at all levels should be designed according to intelligence.
- 2 The relay protection of 110(66)kV main transformer should adopt double configuration. The input, output, tripping and closing, control power supply and network shall be completely independent when the double configuration is adopted.

**5.6.3** The mine transmission and distribution line monitoring should meet the following requirements:

- 1 The environment, geology, wires, fittings, poles and towers may be intelligently monitored in key sections of important high-voltage overhead transmission lines in the mine.
- 2 The cable interlayer and cable well of the main substation of mine shall be equipped with the

automatic fire alarm system. Temperature monitoring should be set in the cable trench and bridge frame where the ground and underground cables are concentrated.

## **5.7 Information guidance and release system**

**5.7.1** The mine shall set up an information guidance and release system. The system shall be composed of information broadcasting center, transmission network and information terminal, and may share transmission network with other mine monitoring and automation systems.

**5.7.2** The information guidance and release system shall have access, classification and collection functions of normal and urgent business information, and form a data repository. It shall be able to provide text, voice, graphics, data and other forms of information release in a hierarchical manner. It shall have the functions of general information release under normal working conditions and information guidance for escape under emergency situations.

**5.7.3** The mine shall set up information terminals for public area of important surface buildings, entrance of underground restricted area and dangerous area, auxiliary shaft head and bottom, locomotive station, waiting chamber, coal-mining face, vicinity of emergency refuge facility, main roadway intersection, route for avoiding disaster, and main man way. The information terminal with information query and release functions should be set up for the main entrance and exit of the mine administrative production office building, the auxiliary shaft head, the waiting chamber and the emergency refuge facility.

**5.7.4** The visual effect and sound field effect of the information terminal shall meet the requirements of the application environment and the requirements of brightness, color and acoustics.

## **5.8 Communication system**

**5.8.1** The mine shall construct wired administrative communication, dispatching communication and wireless communication systems, and all communication systems shall be interconnected.

**5.8.2** The mine with complicated geological conditions and many disaster factors should be equipped with emergency communication system. The mine equipped with rescue teams shall be equipped with disaster relief communication system. The emergency communication system and disaster relief communication system should be interconnected with the mine broadcasting system, dispatching communication system and wireless communication system.

**5.8.3** The mine safety production information shall be able to form mobile interconnection by virtue of the mine wireless communication system.

**5.8.4** Mine downhole teams and above leaders should be equipped with intelligent mobile terminal.

## **5.9 Environmental system**

**5.9.1** All kinds of environmental protection facilities shall have the functions of automatic operation, recording, statistics, analysis and evaluation. The pollutant emission indexes supervised by the administrative department of environmental protection according to law shall have the functions of online monitoring, and automatic grading alarm and grading notification according to the degree of exceeding standard.

**5.9.2** The monitoring content of the environmental system shall meet the following requirements:

**1** The water environment system shall monitor the water inflow, water yield and water quality indexes of mine water treatment and sewage treatment systems.



2 The atmospheric environment system should monitor the TSP and PM<sub>10</sub> indexes of the pollution sources such as the personnel concentration area of the mine comprehensive office building, open coal storage yard and gangue yard, as well as the air pollutant emission index of the mine boiler gas treatment facilities.

3 The sound environment system shall automatically monitor the factory boundary noise of the mine industrial site where the industrial noise sources are concentrated.

4 The solid waste disposal system should monitor the disposal of domestic garbage and coal gangue.

5 The hazardous waste storage and disposal system shall monitor the storage and disposal of radioactive sources, waste engine oil and so on.

6 The ecological environment system shall monitor the mine gangue yard and subsidence area.

7 The groundwater environment system should monitor the groundwater level in the mine field and the surrounding area, and monitor the groundwater quality around gangue pile and industrial site.

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## **6 Mine management system**

### **6.1 One-stop portal management**

**6.1.1** The mine management system shall establish a one-stop portal management system.

**6.1.2** The one-stop portal management shall meet the following requirements:

**1** It shall provide a unified user login entry to meet the authority management of different businesses , and shall have password complexity and verification code functions.

**2** It shall have the unified management function of basic data dictionary ,including employee code , regional code ,organization ,role permission ,and other common mine information.

**3** It shall provide a unified workflow management mechanism that enables related tasks to be executed automatically among all participants according to the rules.

**4** It shall provide a unified message push management mechanism.

### **6.2 Mine safety management system**

**6.2.1** The mine safety management system shall include modules such as hazard source management , hidden hazard investigation management , violation management , quality standardization management , emergency rescue management , learning and training management , special type of work management , one ventilation and three prevention management , and geological survey water control management.

**6.2.2** The functions of each module of the mine safety management system shall meet the following requirements:

**1** The hazard source management shall have the functions of hazard source classification and standardized management , hazard source identification , hazard source monitoring and hazard source warning , and shall be associated with the department assessment.

**2** The hidden hazard investigation management shall have the functions of hidden hazard classification and standardized management , automatic task distribution , real-time tracking of task implementation , and alarm in case of no timely closed-loop , and shall be associated with the staff assessment.

**3** The violation management shall have the functions of violation classification and standardized management and on-site photo forensics , and shall be associated with the staff assessment.

**4** The quality standardization management shall meet the inspection requirements of the provincial coal mine safety administration , shall have the function of automatic assessment scoring and statistics , and shall be associated with the department assessment.

**5** The emergency rescue management shall have the functions of emergency plan management , emergency resource management (rescue equipment , personnel and rescue materials) , GIS graphics management , on-site situation tracking management , daily simulation drill , typical case analysis , post-accident evaluation and so on , and shall be able to conduct data interaction with the on-site monitoring system.

**6** The learning and training management shall have the functions of online learning and online assessment for employees , and the skills of employees should be associated with the attendance.

7 The special type of work management shall have the functions of automatic task distribution, walking route planning, real-time tracking of task implementation and so on for gas inspectors, spot inspectors, blasters and other types of work.

8 The one ventilation and three prevention management system shall have the functions of drawing and technical data management, ventilation management, gas extraction and utilization management, fireproofing management, dust-proof management and so on, and shall have the function of comparative analysis with the real-time monitoring system data.

9 The geological survey water control management system shall have the functions of geological survey, water control and reserve management, and support the online view of data and drawings, and the statistical analysis of geological reserves statements. The dynamic management of geological survey water control shall be realized by combining with the mine geology, hydrology and other monitoring system data.

10 The level of functional configuration of the safety management system intelligence shall meet the requirements in Table 6.2.2.

**Table 6.2.2 Intelligent functional configuration of safety management system**

Module name	Functional configuration							
	Automatic task distribution by computer	Real-time tracking of task implementation	Associated with staff assessment	Associated with department assessment	Monitoring early-warning	Classification and standardized management	Configure RFID tag card	Configure hand-held terminal
Hazard source management	-	-	-	●	●	●	○	○
Hidden hazard investigation management	●	●	●	●	●	●	●	●
Violation management	-	-	●	●	●	●	-	●
Quality standardization management	●	●	-	●	●	●	◎	◎
Emergency rescue management	●	●	-	●	●	●	-	-
Learning and training management	-	-	●	●	●	●	-	◎
Special type of work management (gas inspectors, blasters, spot inspectors, etc.)	●	●	●	●	●	●	●	●
One ventilation and three prevention management	-	◎	-	◎	●	●	-	-
Geological survey water control management	-	◎	-	◎	●	●	-	-

Table 6.2.2(continued)

Module name	Functional configuration								
	Anti-cheating	Support cloud deployment	Support WEB operation	Unified authority management	Support unified message release	Provide standardized data interface	Statistical analysis of statement	Support GIS graphics	Paperless process management
Hazard source management	●	○	●	●	●	●	●	○	○
Hidden hazard investigation management	●	○	●	●	●	●	●	○	○
Violation management	●	○	●	●	●	●	●	○	○
Quality standardization management	●	○	●	●	●	●	●	○	○
Emergency rescue management	●	○	●	●	●	●	●	○	○
Learning and training management	●	○	●	●	●	●	●	-	○
Special type of work management(gas inspectors, blasters, spot inspectors, etc.)	●	○	●	●	●	●	●	-	○
One ventilation and three prevention management	●	○	●	●	●	●	●	○	○
Geological survey water control management	●	○	●	●	●	●	●	○	○

Note: "●"-shall, "○"-should, "○"-may.

### 6.3 Mine production management system

**6.3.1** The mine production management system shall include production planning and scheduling management, production technology management, electromechanical equipment management and other systems.

**6.3.2** The functions of mine production management system shall meet the following requirements:

**1** The production planning and scheduling management system shall have the functions of production planning and daily scheduling management, and can realize production planning and scheduling according to the enterprise ERP data.

**2** The electromechanical equipment management system shall have the function of remote online diagnosis of health condition, and shall have the functions of regular and automatic operation and maintenance management and accessories inventory identification.

**3** The production technology management system shall have paperless management functions such as preparation of procedures and measures, technical data, professional drawing design, mining production link tracking, project progress tracking, and production and technical indexes.

**4** The level of functional configuration of the production management system intelligence shall meet the requirements in Table 6.3.2.

**Table 6.3.2 Intelligent functional configuration of production management system**

Module name	Functional configuration							
	Support WEB operation	Unified authority management	Support unified message release	Provide standardized data interface	Statistical analysis of statement	Support GIS graphics	Paperless process management	Support cloud deployment
Production planning and scheduling management	●	●	●	●	●	◎	◎	◎
Production technology management	●	●	●	●	●	●	◎	◎
Electromechanical equipment management	●	●	●	●	●	○	◎	◎

Note: "●"-shall, "◎"-should, "○"-may.

### 6.4 Mine management system

**6.4.1** The mine management system shall include office automation management, enterprise ERP and other systems, and the systems shall be able to exchange data with each other.

**6.4.2** The office automation system shall have functions such as paperless office, task message alert, and email alert.

**6.4.3** The enterprise ERP shall include financial management, cost management, contract management, transportation and marketing management, material supply management, warehouse management and other systems, and shall provide standardized data interface.

**6.4.4** The level of functional configuration of the management system intelligence shall meet the requirements in Table 6.4.4.

**Table 6.4.4 Intelligent functional configuration of management system**

Module name	Functional configuration							
	Support WEB operation	Unified authority management	Support unified message release	Provide standardized data interface	Statistical analysis of statement	Paperless process management	Support cloud deployment	
Office automation management	●	●	●	●	●	●	◎	
Enterprise ERP	Financial management	○	○	○	●	●	●	○
	Cost management	◎	○	○	●	●	●	○
	Contract management	◎	○	○	●	●	●	○
	Warehouse management	◎	○	○	●	●	●	○
	Transportation and marketing management	◎	○	○	●	●	●	○
	Material supply management	◎	○	○	●	●	●	○

Note: "●"-shall, "◎"-should, "○"-may.

## 6.5 Decision support system

**6.5.1** The mine decision support system shall be able to integrate production system and management system data, and shall be able to establish an analysis model as well.

**6.5.2** The decision support system shall have the following functions:

**1** It shall establish a safety level evaluation model for the key mine operation area and comprehensively analyze and evaluate the safety status of the operation area. It should establish a risk evaluation system to analyze and predict the possibility of accidents in the operation area.

**2** It should establish a dynamic production scheduling model, effectively analyze the business data in the ERP, formulate a reasonable production scheduling plan based on the production management data, and conduct reasonable scheduling of mine production and transportation logistics.

**3** It shall establish an operation and maintenance management model of large equipment, reasonably adjust the equipment maintenance and the operation time of large energy-consuming equipment, and analyze the health condition, load rate, breakdown rate, energy consumption and other indexes of the equipment in the main production link.

**4** It shall establish a fine cost accounting model to effectively analyze the various consumption of the team in the production process, so as to reduce the production cost and improve the profitability of enterprise.

**5** After the occurrence of accidents, it shall be able to automatically provide rescue personnel, rescue materials, rescue equipment, accident site environment, escape route and other information in combination with the specific emergency plan, and be able to track and manage the progress of the situation.

## **7 Information security**

### **7.1 General requirements**

**7.1.1** The security design of the information system shall comply with the provisions of the current national standards, such as GB/T 20271 *Information Security Technology-Common Techniques Requirement for Information System* and GB/T 22239 *Information Security Technology-Baseline for Classified Protection of Information System Security*.

**7.1.2** The security protection ability of the information system should be designed according to the secondary basic requirements.

**7.1.3** Special products for computer information system security shall have testing and selling licenses issued by the Ministry of Public Security.

### **7.2 System security**

**7.2.1** The new version of the operating system with a higher level of security shall be used on the server.

**7.2.2** The operating system and database system shall carry out identity identification, authentication and right control for users.

**7.2.3** The system shall comprehensively adopt security technologies such as access control, security audit, and malicious code resistance to formulate security policies.

### **7.3 Network security**

**7.3.1** The network system shall meet the following requirements:

**1** Different subnets or network segments shall be divided according to factors such as the job function and importance of each department and the importance degree of information involved.

**2** Security technologies such as access control, security audit, intrusion prevention, and antivirus shall be comprehensively adopted to formulate security policies.

**3** The users who log in to the network equipment shall be identified and authenticated, and the login address of the network equipment administrator shall be restricted.

**4** The MAC address and IP address of the access network equipment shall be bound to the port address of the switch to which it is connected.

**7.3.2** The firewall and intrusion prevention system shall be deployed in the exit area of the mine Internet and the private network of main subsystem, and the intrusion prevention system shall be linked with the firewall.

**7.3.3** The security measure of physical isolation shall be adopted between mine integrated monitoring and automation network and mine information management network.

**7.3.4** The mine shall establish the network anti-virus system for the monitoring and automation system and the information management system.

### **7.4 Application security**

**7.4.1** The application system shall meet the following requirements:

- 1 The special entry control module shall be provided to identify and authenticate the login user.
  - 2 Access control, security audit and other techniques shall be used to configure security policies.
  - 3 Communication integrity and confidentiality technologies shall be adopted to ensure the integrity of data and encryption of sensitive information in the communication process.
  - 4 The software fault-tolerant technology shall be available to continue to provide partial functions and ensure that necessary measures can be taken in the event of a fault.
- 7.4.2** The data center shall establish a data backup and recovery system, and shall be equipped with backup and recovery servers, automatic backup software and storage equipment.
- 7.4.3** The operating control computer for the monitoring and automation system shall disable the interface of the removable storage medium.

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## Explanation of wording in this standard

1 Words used for different degrees of strictness are explained as follows in order to mark the differences in implementing the requirements of this standard.

1) Words denoting a very strict or mandatory requirement:

"Must" is used for affirmation, "must not" for negation.

2) Words denoting a strict requirement under normal conditions:

"Shall" is used for affirmation, "shall not" for negation.

3) Words denoting a permission of a slight choice or an indication of the most suitable choice when conditions permit:

"Should" is used for affirmation, "should not" for negation.

4) "May" is used to express the option available, sometimes with the conditional permit.

2 "Shall comply with..." or "shall meet the requirements of..." is used in this standard to indicate that it is necessary to comply with the requirements stipulated in other relative standards and codes.

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## List of quoted standards

- GB 50116 *Code for Design of Automatic Fire Alarm System*
- GB 50174 *Code for Design of Data Centers*
- GB 50314 *Standard for Design of Intelligent Building*
- GB 50348 *Technical Code for Engineering of Security and Protection System*
- GB 51024 *Code for Design of Intelligent Monitoring and Control System of Coal Mine Safety Production*
- GB/T 20271 *Information Security Technology-Common Techniques Requirement for Information System*
- GB/T 22239 *Information Security Technology-Baseline for Classified Protection of Information System Security*
- MT/T 1081 *Network Switch for a Coal Mine*
- MT/T 1130 *Field-Bus for a Coal Mine*
- MT/T 1131 *Ethernet for a Coal Mine*