China’s Mine Rescue System and Development of Mine Rescue

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Abstract: This paper briefly reviews the history of China’ mine rescue in following aspects: mine rescue troops, development and technical equipment, mine rescue management system and legal system construction, etc., introduces China’s existing mine rescue system, elaborates the response mechanism at different levels, scientific decision making mechanism and other operation mechanisms of the mine rescue system. It also introduces the work and the role of mine rescue system in mine accident rescue, legal system construction, rescue team construction and international exchange and cooperation, etc. since its establishment. This paper also prospects the future of mine rescue system construction and development of mine rescue.

Key Words: China, Mine Rescue, System, Working Mechanism

As an important component of the mine work safety, great attention has been paid to mine rescue by the Chinese government. Strategic planning in terms of constructing 6 supporting systems made by State Administration of Work Safety (SAWS) and Sate Administration of Coal Mine Safety (SACMS) has promoted the mine rescue system construction. The rescue operation mechanism is being perfected. At present, a preliminarily formed mine rescue system has played an important role in mine accident rescue, legal system construction and international exchange and cooperation.

1. Overview of Mine Rescue History in China

With sustainable development of the mining industry, China’s mine rescue has been developed rapidly. Mine rescue troops are continuously growing in strength. Technical equipment level has been kept raising, and the management system, laws and regulations of mine rescue are being gradually established and perfected.

1.1 Creation and Development of Mine Rescue Troops

Since the founding of P.R.China, based on relevant laws and regulations on work safety stipulated by Chinese government, coal enterprises have built rescue teams one after another. In addition, some big coal cities and counties have established mine rescue teams in coal industry management departments. In 1949, 3 coal mines, Fushun, Fuxin and Liaoyuan coal mines established the first batch of professional mine rescue teams with total 66 mine rescue team members. After development for years, up to now, 27 provinces, autonomous regions and municipalities in China totally have 76 mine rescue brigades, 449 middle sized teams and 1445 rescue teams. The rescue personnel who are engaged directly in mine accident rescue are up to 14328 people. China has been attaching importance to the technical training of mine rescue personnel. Since 1952, the formal Ministry of Coal Industry organized a number of training courses for mine rescue team captains. 1200 members of mine rescue brigades and middle sized teams have received training. After the founding of SAWS, the training material “Mine Rescue” was re-formulated, and 3 training courses for mine rescue team captain were held in 2002. 148 mine rescue officers were trained. Every year each province and region has technical training courses to train mine rescue

team captains and members. Central and local governments invest funds every year for mine rescue equipment and renewal of equipment. Mine enterprises make retrofit and renewal for the technical equipment of their mine rescue teams. The infrastructure, technical equipment and basic conditions of mine enterprises' rescue troops are gradually getting strengthened and improved.

1.2 Mine Rescue Management System and Legal System Construction

China's mine rescue management system is gradually established with changes. In 1950s, military management was carried out for the mine rescue. In 1994, the management system of mine rescue general troop with a branch team, a district brigade, a middle sized team an auxiliary team was formed. After the dismissal of Ministry of Coal Industry, instead, the State Commission of Economy and Trade was responsible for the coal mine safety and mine rescue. After the State Administration of Coal Mine Safety was founded in 1999 and State Administration of Work Safety founded in 2001, the State Council stipulated the two Administrations' responsibilities in organizing, directing and coordinating mine rescue and emergency rescue. In 2002, SAWS and SACMS put the work regarding strengthening mine rescue as an important task into agenda, and approved the construction plan of the national mine rescue system. After constant efforts for several years, the current national mine rescue system has been formed.

With regard to the legal system construction, in 1956 the formal Ministry of Coal issued "Regulations of Mine Rescue Team" and "Fighting Rules of Mine Rescue Team". In 1978 the Ministry of Coal again issued "Rules of Mine Rescue Team Work" and "Fighting Preparative Criteria and Inspection Method of Mine Rescue Team". In 1987 the Ministry of Coal issued "Mine Rescue Regulations", "Fighting Rules of Military-like Mine Rescue Team" and "Management Method of Military-like Mine Rescue Team". In 1995, the Ministry of Energy revised the above three regulations and incorporated them into the current existing "Coal Mine Rescue Regulations". In 1993 and 2002, China issued and implemented the "Mine Safety Law of the People's Republic of China" and "Work Safety Law of the People's Republic of China". Several local regulations have been issued one by one, which played a positive role in promoting the legal construction of mine rescue.

1.3 Existing Problems of Mine Rescue

Although certain base has been laid in China's mine rescue, following problems still exist:

(1) Lack of overall plan for the establishment and layout of mine emergency and rescue organizations. There is no enough rescue strength and its layout is scattered. Most of the middle and small sized coal mines and non-coal mines has no mine rescue teams. Most of village and township and private coal mines has no service from mine rescue teams. In case of an accident, it would be very difficult to implement timely and efficiently the emergency rescue.

(2) The mine rescue system formed during the period of the planning economy is affiliated to different enterprises and departments. There is no unified and coordinated mine rescue system and mechanism to form. Each existing mine rescue team does work in its own way, which not only wastes resource but also is not beneficial to mine rescue.

(3) Lack of rescue fund input. Rescue equipment is backward. There are no clear communications and no stable rescue troops. Rescue employees are at old ages and low quality. The overall quality of rescue troops are decreasing.

2. Existing Mine Rescue System

According to the requirement of mine work safety and mine rescue tasks, and based on existing problems, SAWS and SACMS decided to consolidate the existing mine emergency rescue resources and establish a national mine rescue system with functions of implementing management by different category, undertaking responsibility at different levels, mainly relying on local government and mine enterprises for accident rescue, and combining local management with central command and coordination so to form an emergency mechanism which could make coordinate actions, with variety of functions, could be activated sensitively and make efficient operation. The mine rescue system was started in 2003. Now the system has preliminarily formed and is playing important roles in mine rescue.

2.1 Mine Rescue System

2.1.1 Mine Rescue Management System

The mine rescue system consists of the State Mine Rescue Command Center, provincial level mine rescue command center, municipal and county level mine rescue command departments and mine enterprise rescue management offices and other organizations (as shown in Fig. 1)

(1) State Mine Rescue Command Center

In January 2003, the State Mine Rescue Command Center was established. It is responsible for organizing and coordinating mine rescue of the whole country, for drafting mine rescue related regulations and safety technical criterion, for organizing spread and application of mine rescue new technology and new equipment, responsible for the whole country mine rescue contest, the qualification appraisal of mine rescue troops, for organizing the whole country mine rescue technical training and organizing international exchange and cooperation project in terms of mine rescue.

(2) Mine Rescue Command Organization at Provincial Level

Directed by State Mine Rescue Command Center, it is provincial command center's responsibility to draw up the emergency plan of mine work safety and accident rescue in local regions, to organize, direct and coordinate mine rescue routine work and emergency rescue dispatch and command. Currently 18 provincial level mine rescue command centers have been established. Other provincial level centers are under establishment.

(3) Emergency Rescue Management Department at Municipal and County level

Emergency rescue management departments in relatively large mine cities and counties are to be responsible for organizing and coordinating the region mine rescue. Its business is directed by higher level emergency rescue department at.

(4) Emergency Rescue Management Departments in Mine Enterprises

Emergency rescue department in mine enterprises is responsible for organizing its own emergency rescue, making emergency rescue plan, inspecting emergency rescue equipment, reserving emergency rescue goods and materials and organizing emergency rescue training, etc.

2.1.2 Mine Rescue Troops System

Containing two parts: mine rescue troops and medical first-aid troops.

2.1.2.1 Mine Rescue Troops

(1) National Level Mine Rescue Base

The national level mine rescue base is the key mine emergency rescue troop for very severe accident rescue, and the important strength of mine accident rescue in China. Based on troops' limited size, rescue equipment, experience, service scope and other conditions, currently 14 national level mine rescue bases are established: Pingdingshan, Kailuan, Furong, Hegang, Datong,

Huainan, Liuzhi, Yanzhou, Pingzhuang, Tongxhuan, Xinjiang, Jinchuan, Jiangtong and Huaxi as shown in Fig. 2.

(2) Regional Backbone Mine Rescue Troops

77 mine rescue teams due to relatively stronger rescue force and covering wider service areas, have been selected as provincial region mine rescue backbone from existing mine rescue troops in each province and region. Of course, these selected troops will be technically reformed before becoming regional mine rescue backbone troops.

(3) Basic Level Mine Rescue Team

Rescue teams established by mine enterprise or local governmental department are basic force for mine emergency rescue. It will be activated immediately and arrive at the accident spot to implement rescue.

2.1.2.2 Medical Rescue Troops

(1) Mine Medical Rescue Center

In the end of 2002, the National Mine Medical Rescue Center was established. It is responsible for drawing up regulations and technical criteria related to mine first aid, directing the first aid for the wounded in the mine accident of the whole country, for the dissemination and application of new technology and equipment related to the mine first aid, and for developing international exchange and cooperation on the mine first aid and medical technology.

(2) Branch of Provincial Level Mine Medical Rescue

A batch of provincial level mine medical rescue bases will be established, which will be responsible for the provincial region first aid of the severe wounded in the mine accident. Their professional work will be directed by the National Mine Medical Rescue Center. Up to now, 14 provincial mine medical rescue branch centers were established in Yangquan, Datong, Fushun, Yanzhaou, Zibo, Huaibei, Tongling cities which are affiliated to 9 provinces and regions in Shanxi, Liaoning, Shandong and Anhui, etc.

(3) Enterprise Medical Rescue Station

Local mine enterprise hospital will be the mine medical rescue station, responsible for the enterprise first aid of the wounded in accidents.

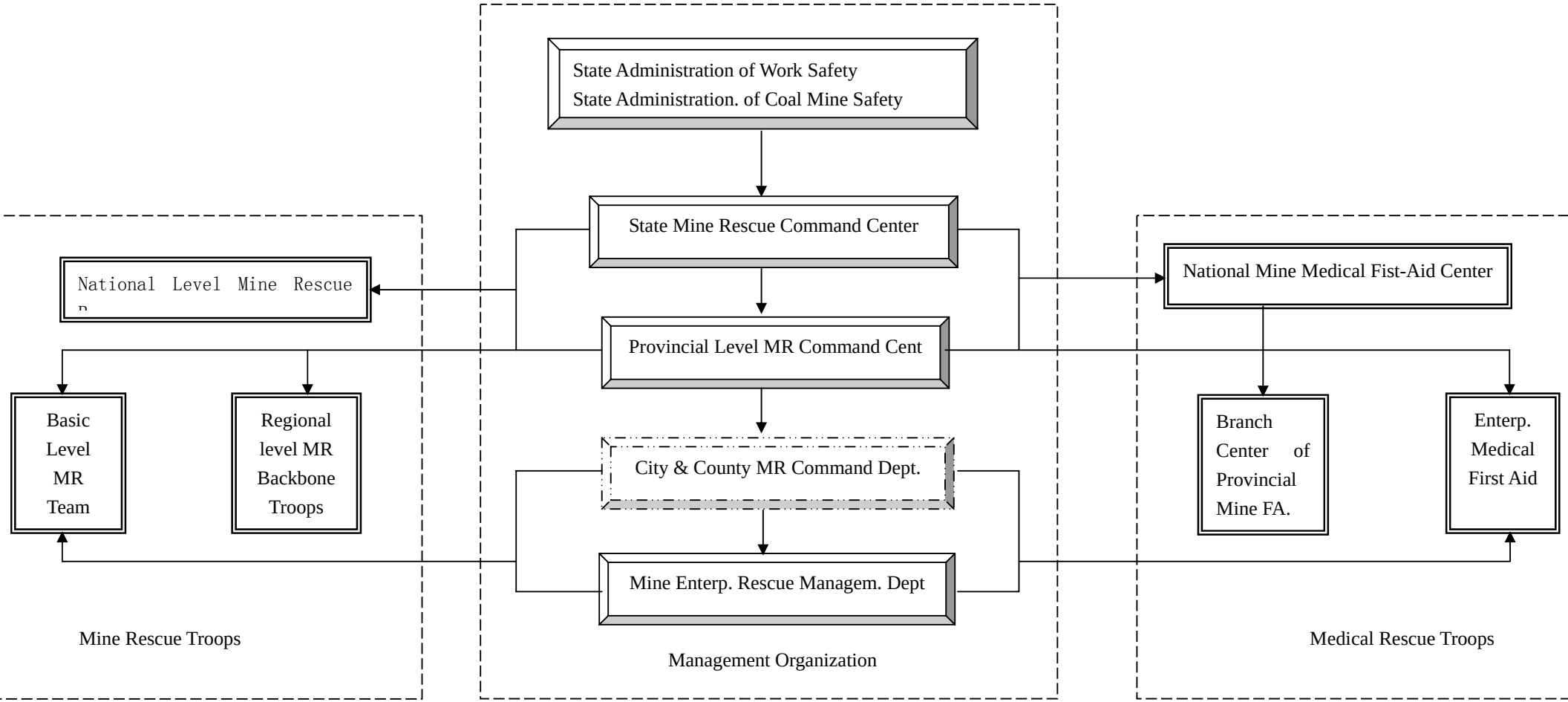

Fig. 1 Mine Rescue Management & Troops System

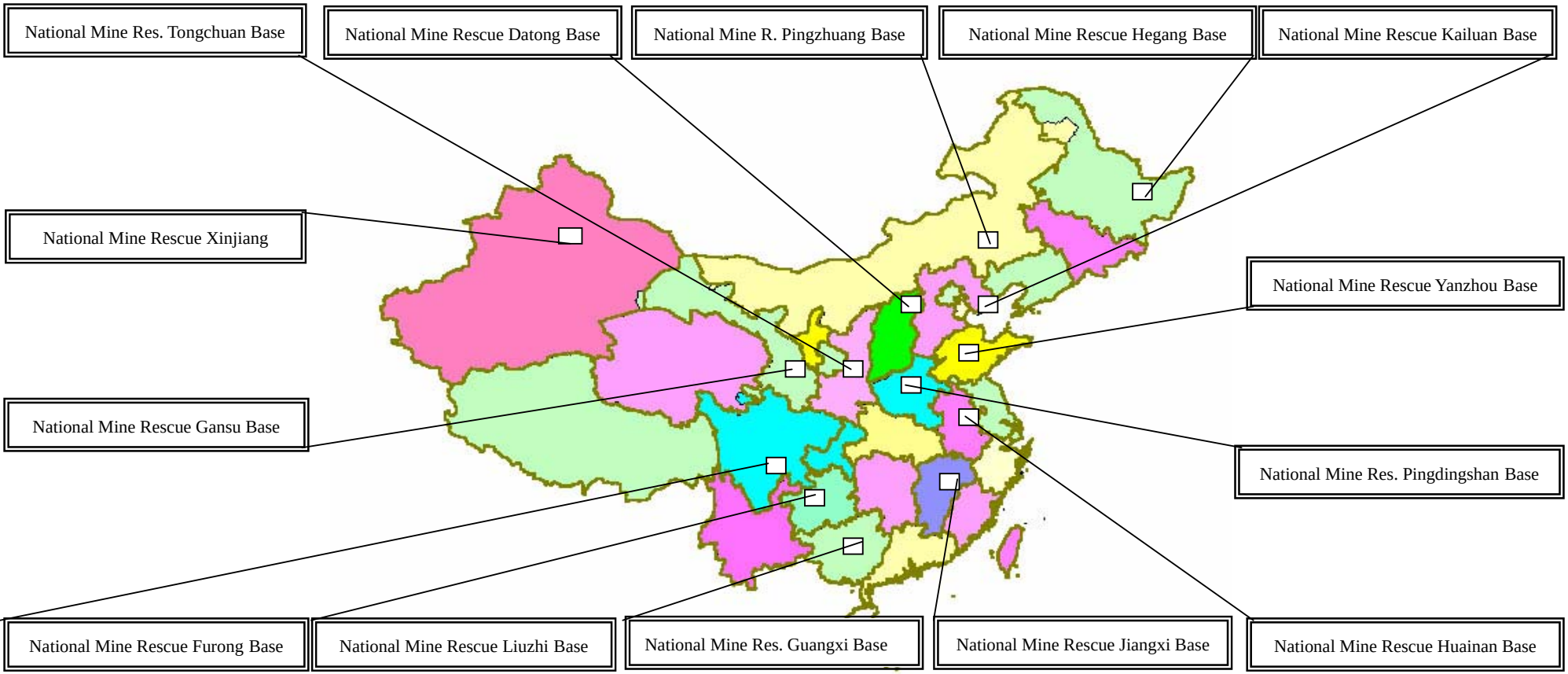

Fig. 2 Sketch Map: National Mine Rescue Base Distribution

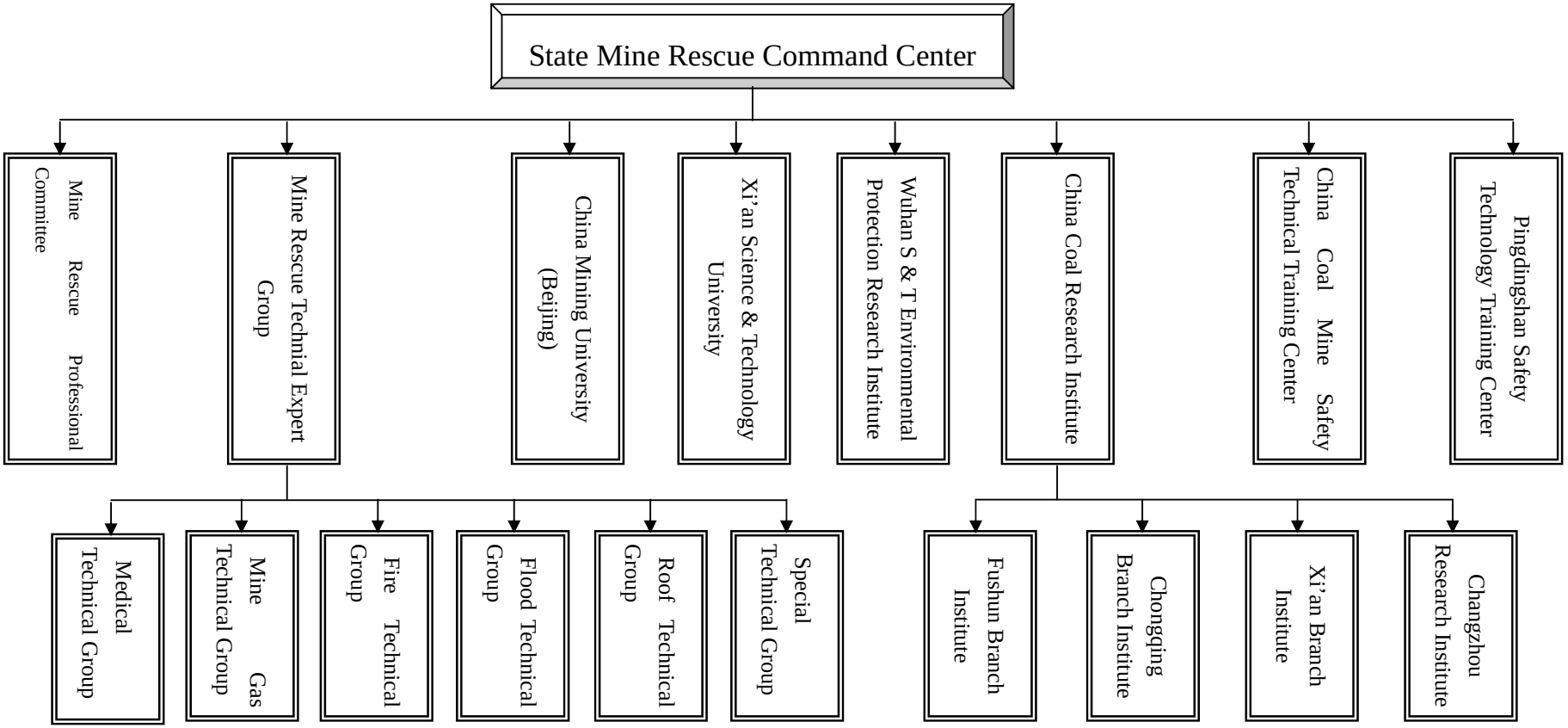

Fig.3 Sketch Map of Mine Rescue Technical Support System

2.1.3 Mine Rescue Technical Support System

This system provides technical support in the following aspects: revision of regulations and criteria of mine emergency rescue; expert support for the accident treatment and medical first aid; study on the accident reason, accident prevention, emergency treatment and appraisal technologies, technical support for severe and very severe accident rescue technologies, technical support in contest and dissemination. The system includes 4 parts: (1) Mine Emergency Rescue Expert Group; (2) Mine Rescue Technical Research Center; (3) Mine rescue Technical Training Center and (4) Professional Academical Organization.

2.1.4 Ensuring System of Mine Rescue Equipment

China' ensuring system of the mine emergency rescue equipment is as shown in Fig.4

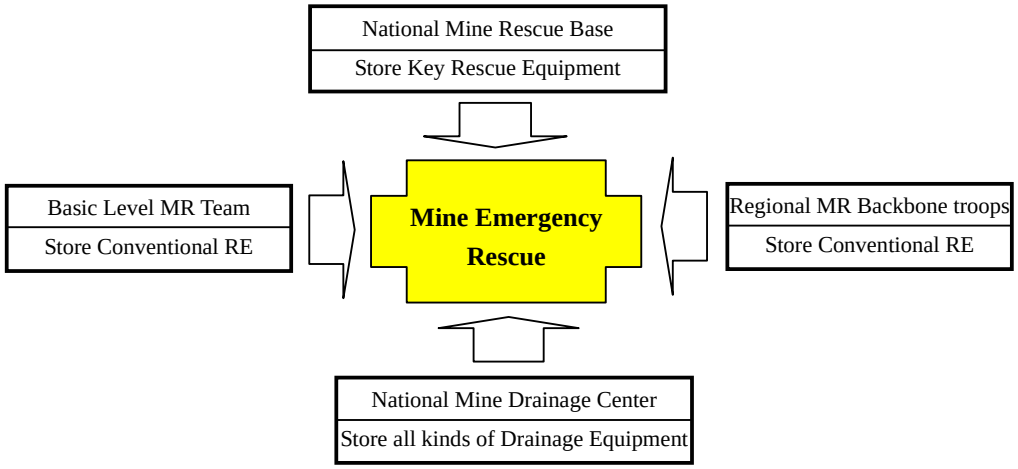

Fig. 4 Mine Rescue Equipment Ensuring System

(1) Central and local governments make investment to procure advanced rescue equipment, which is stored in national level mine rescue base and regional mine rescue troops, used for severe and complicated mine accident rescue.

(2) It is requested that each mine enterprise and relevant local governmental departments shall ensure the fund input for mine rescue troops and based on laws and regulations equip with necessary equipment and keep it in good condition.

(3) It is planned to draw 6 water drainage stations in Tangshan, Jiangxi, Fengfeng, Jinan, Henan and Sichuan into national mine emergency rescue system. Various kinds of mine water drainage equipment stored will be used for severe mine flood emergency rescue.

2.2 Operation Mechanism of Mine Rescue System

2.2.1 Response Mechanism by Different Levels to Sudden Accident

When a mine accident happens, mine manager shall firstly get its own rescue team and medical rescue station to carry out rescue, and inform it to local government and higher level mine rescue command center or rescue management department. Local government shall organize local rescue force to implement rescue. If they are unable to conduct effective rescue, they should immediately inform higher level mine rescue command center and make a request for reinforcement. The mine rescue command center at each level shall report the accident rapidly to higher level center, which

shall make a decision to allocate backbone rescue troops of the national or regional mine rescue base, national mine medical rescue center or provincial branch center to carry out emergency rescue.

2.2.2 Decision Making Properly and Rescue Mechanism

Proper decision making and method, and advanced rescue technical equipment is the key factor to determine the rescue success or failure. The emergency rescue expert group is the important component to the rescue headquarters. The headquarters shall make a proper decision based on scientific analysis, accurate survey and careful thinking.

2.2.3 Mechanism of Resource Sharing and Social Mobilization

It is necessary to build a mine rescue equipment ensuring and reserving mechanism. A number of mine rescue teams work together to jointly complete emergency tasks. The national and provincial/regional mine rescue backbone troops shall store up advanced big sized rescue equipment and make sure that the equipment can be allocated at any time to achieve resource sharing. To ensure rescue fund input, we should fully get the society to donate.

2.2.4 Positive Provision Mechanism

To make precautions against accident is a basic principle and important task in the routine work of mine rescue troops. Mine rescue department at every level should conduct safety inspection regularly according to the mine rescue agreement and the “Emergency Plan of Mine Accident”, which should be formed a system. It is requested to establish and make it perfect a system of hidden danger check-up and harnessing, and precautions making for severe accident.

2.2.5 Training and Drill Mechanism of Mine Rescue Troops

The mine rescue personnel should be trained based on regulations, and be qualified to go on his post after passing examinations. Some of the mine rescue managers and workers will be selected for training abroad so that they could learn international advanced mine rescue technology and concept. It is requested that each level mine rescue headquarters and mine enterprises organize regularly simulated rescue drill based on the emergency plan. Mine rescue troops are requested to organize a team to participate in provincial or national mine rescue contests, and actively attend international mine rescue contest. Through competition and drill activities, rescue troops could constantly raise physique and technical level so as to compete all kinds of rescue tasks.

2.2.6 Ensuring and Reserving Mechanism of Mine Rescue Equipment

Firstly, mine rescue troops should equip with various kinds of technical equipment, rescue training material and communication facilities for accident handling, and keep them in nice condition. There should be qualified facilities and spots for combat readiness and team members on duty, rescue training, skill and physical energy training, etc. Secondly, the national mine rescue bases and regional mine rescue backbone troops should store up big sized rescue equipment. The third point is to carry out strict management and maintenance regularly for mine rescue equipment, and keep renewal of the equipment to ensure the equipment is in good condition.

2.3 Main Work Done Since the Mine Rescue System Established

2.3.1 Important Role Played in Accident Rescue

Since the mine Rescue system was established, a number of severe accidents have been rescued and handled efficiently. In 2004, a total of 3383 coal mine or non-coal mine accidents all over the country were rescued and handled. 5705 victims and trapped people were rescued. 1572 people were out of danger through emergency treatment. In the first half of 2005, mine rescue troops from the whole country participated in and handled 2016 accidents of different kinds. 2537 tripped

miners were rescued, of which 916 people were survived.

China's mine rescue system played important roles with the characteristics of prompt responose, coordinated command, jointly conducting operationsand technical support, and successfully fulfilled the rescue tasks in the following severe accidents rescue: the flood accident on April 11, 2004 in Chaohua Mine, Zhengzhou, Henan province; Very severe fire accident on November 20, 2004 in Shahe Iron Mine, Xingtai, Hebei; Very severe gas explosion accident on November 28, 2004 in Shaaxi Tongchuan Chenjiashan Coal Mine; The flood accident of Guizhou Tianchi Coal Mine on December 12, 2004; The gas explosion accident of Xishui Coal Mine in Shanxi Shuozhou city on March 19, 2005; The rescue for the gas explosion accident on September 29, 2005 in Hebei Chengde Nuanerhe Coal Mine; The gas explosion accident on July 11, 2005 in Xinjiang Fukang Shenlong Coal Mine and the mine flood accident on August 7, 2005 in Guangdong Meizhou.

2.3.2 Construction of Mine Rescue Regulations, Criteria and Emergency Plan Pushed Forward

The "Guideline for Mine Rescue Work" was issued in 2004. The "National Disaster Emergency Plan for Mine Work Safety Accident" has been formulated. The "Mine Rescue Regulations" and "Rules of Mine Rescue Team Qualification" are also under formulation. State Mine Rescue Command Center issued the "Announcement on Establishing and Perfecting the Reporting System of Mine Rescue". These rules and regulations will play a positive role in mine rescue legal construction.

2.3.3 International Exchange and Cooperation Strengthened

In October 2003 we attended the 1st International Mine rescue Conference held in South Africa. China State Mine Rescue Command Center formally joined the International Mine Rescue Body. Form 2003 to 2005, the Sino-American cooperative programme "Improving China Coal Mine Safety Plan" were implemented, of which the mine emergency rescue is an important portion of the programme. At present, the training programme of sending mine rescue officers to USA, the International Symposium on the Construction of China's Emergency Rescue System and other tasks have completed. The programme implementation is of great significance to raise China's mine rescue level.

In December 2004, the International Symposium on Construction of China's Mine Emergency Rescue System was held successfully. Chinese and American experts made 8 suggestions on improving China's mine emergency rescue system. American side made a suggestion on expanding cooperation and exchange in mine emergency rescue. Both sides have reached an intent of further cooperation for preparing for 2006 international mine rescue contest.

Our delegation has attended the third and fourth international mine rescue contests and won the second and third place for the collective item, the first, second and third place for the personal item. We learned and exchanged advanced experience and method of the first aid training and rescue contest. In 2006 the international mine rescue contest will be held in China. At present, the preparatory work of the event is conducting smoothly. We will make this contest a high level competition and a great get-together of mine rescue personnel.

With regard to the training abroad, we have sent 2 batches of mine rescue team members to Poland for training in 2003 and 2004. We are organizing mine rescue team members for training in South Africa in December this year.

2.3.4 Mine Rescue Troops Strengthened

In 2002 the central government invested114 million RMB to equip 86 mine rescue troops of the

whole country with positive pressure oxygen breathing apparatus and mine rescue vehicles. In 2004 the government again invested 77 million RMB equipping 14 mine rescue bases and state mine rescue command center with ambulance, mobile gas analyzing station, positive pressure oxygen breathing apparatus, CO_2 fire extinguisher and other advance rescue equipment. Each mine enterprise has invested more funds for mine rescue. We are striving to make a substantial improvement for China's mine rescue equipment in 2 or 3 years.

Currently, State Administration of Work Safety has issued "Management Method of Mine Rescue Team Qualification Appraisal", based on which the whole country mine rescue troops will be appraised for qualification and certifications of different level will be issued. Non qualified mine rescue troops will be force to stop business for improvement in a restricted period.

It is requested to expedite troops construction and conduct training for mine rescue personnel. In the second half of this year, the three levels training network of the national level training center, provincial level training center and rescue brigade will be established in order to raise the comprehensive quality of mine rescue troops.

3. Prospect for Future Rescue System Construction and Rescue Work

In recent years, the State Council has been attaching greatly importance to emergency rescue and has taken a series of measures to push forward the emergency rescue work. Recently, State Mine Rescue Command Center of SAWS has made the "the Tenth Five Year Plan for Mine Rescue". The construction of the mine rescue system will enter into a period of fast development in the years to come.

(1) Further strengthen and perfect the construction of mine rescue management and troops system. All provincial level mine rescue command centers will be established. It is expected that 20 national mine rescue bases and 100 regional rescue backbone troops will be built, forming a mine rescue network that covers the whole country in order to raise the emergency rescue capability of the whole country.

(2) Strengthen the construction of the technical support system of mine rescue. Raise rescue technical level, conduct various kinds of studies related to accidents in order to strengthen the ability of mine rescue officers and men's analysis and judgement to underground accident spot situation, and to raise rescue troops operational ability on their own.

(3) Strengthen training and drill to mine rescue troops. From next year, based on the new examination and management system and teaching programme, and using the mine rescue three level training network, SAWS will start organizing and implementing mine rescue technical training and examination in an all-round way in order for raising mine rescue troops construction standard and rescue capability.

(4) Build and perfect the mine rescue communication and information system. We will make use of advance emergency rescue technology and equipment from home and abroad, take the central web station of SAWS as the central point to build a perfect mine rescue communication information system and keep it an unobstructed information passage, and establish step by step the remote rescue video frequency group consultation system. By means of SAWS's video frequency communication system, public network and other remote transmission system, underground rescue pictures can be transmitted to State Mine Rescue Command Center.

(5) Taking the preparation for the 5^{th} International Mine Rescue Contest as a turning point to promote mine rescue international exchange and cooperation. Preparing for the 5^{th}

International Mine Rescue Contest is a key point of our work for this year and next year. The theme of this international mine rescue contest is “Cooperation, Exchange, Promotion and Development’. Through the contest, it is expected that our mine rescue troops will learn advanced technology and experience from the international mine rescue circle in order to raise our mine rescue troops quality and rescue operational level in an all-round way.

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