Construction of Emergency Management Standardization System-Based on Shenzhen Emergency Management Practice Exploration

Shanshan Jiang[1], Wenhong Huang[2]*, Feifei Liu[3], Qinghua Yuan[4]

2409023100@qq.com[1], Corresponding author:huangwh@szsti.org[2], liuff@szsti.org[3], yuanqh@szsti.org[4]

Shenzhen Technology Institute Of Uban Public Safty, Shenzhen, 518038, Guangdong, China

Abstract. Since the reform of Shenzhen's emergency management organization, Shenzhen's emergency management system, which conforms to the characteristics of China's big country, is taking shape. As an important part of the construction of the emergency management system, the standardization system of emergency management plays an important supporting role in promoting the modernization of the emergency management system and capacity. At present, the existing emergency management standards among various industries do not connect with each other and show the phenomenon of segmentation, which can not meet the needs of building a "Emergency response covers all hazards"pattern. In view of the above problems of standardization of emergency management, combined with advanced experience at home and abroad, based on the risk characteristics of Shenzhen, this paper sorted out and analyzed the current situation of standards of safety production, disaster prevention and reduction and emergency rescue in Shenzhen, constructed the framework of Shenzhen's emergency management standard system, put forward action suggestions on standardization of emergency management in Shenzhen, and finally provided reference for promoting the standardization work pattern of emergency management in Shenzhen.

Keywords: emergency management; standardization; standard system framework

1 Introduction

Emergency management is a collection of a series of management behaviours taken in the process of prevention, response and recovery of all kinds of emergencies (emergencies)[1]. Emergency management standard system, as an important part of emergency management, can further improve the standardization, scientificity and efficiency of emergency management, and play an important role in promoting the modernization of China's construction of emergency management systems and capabilities. Since the reform of the emergency management system in 2018, Shenzhen has formed the Municipal Emergency Management Bureau, which is mainly responsible for coordinating the city's various departments in all districts to respond to emergencies such as the production safety category, natural disasters and other emergencies and comprehensive disaster prevention, mitigation and relief work, and is responsible for the integrated supervision and management of production safety and the supervision and management of production safety in the industrial, mining and trade industries[2]. However, at present, the top-level design and overall planning of the emergency management standard system is still in its infancy, and the unified emergency management standard system covering

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the fields of safety production, disaster prevention and mitigation and emergency relief still needs to be improved.

On the contrary, developed countries, on the one hand, have established a perfect emergency management organization system, and on the other hand, have established a perfect emergency management regulations and standards system, which all provide reference experience for China to build an emergency management standardization system adapted to the pattern of "Emergency response covers all hazards".

This paper is to analyze the current situation and needs of the emergency management standard system based on the current situation of safety production, disaster prevention and mitigation and emergency rescue standards in Shenzhen, drawing on the relevant practices and experiences at home and abroad, combining with the risk characteristics of Shenzhen, build the framework of the emergency management standard system applicable to the risk characteristics of Shenzhen, put forward the direction and content of the construction of the emergency management standards in Shenzhen and make suggestions for the advancement of the construction action of the emergency management standard system in Shenzhen.

2 Analysis of the current situation of the standard system of emergency management in Shenzhen

The standard system of emergency management laws and regulations includes laws, administrative regulations, local regulations, administrative regulations, normative documents and standards. At present, the competent departments of various industries in Shenzhen City in their respective fields to establish the framework of the standard system within the corresponding scope of responsibility or the implementation of the framework of the standard system issued by higher-level units, in their respective areas of responsibility to carry out the work of standardization and revision of emergency management-related standards. For example, Shenzhen Municipal Water Bureau has established an industry-standard system[3]; Shenzhen Municipal Bureau of Transportation (SZMT) implements the transportation industry standard system and the transportation safety and emergency response standard system issued by the Ministry of Transportation[4-5]; and Shenzhen Municipal Bureau of Housing and Construction (SZMHB) establishes a standard system in the field of engineering and construction[6].

However, due to the lack of a coordinating organization for the formulation and revision of emergency management standards, implementation assessment and daily management, the existing emergency management standards among various industries are not connected and are divided into different sectors, and there is a lack of unified planning for the basic general standards of cross-disaster and cross-industry areas, which cannot meet the needs of building an "Emergency response covers all hazards" pattern. At the same time, due to the intersection of the responsibilities of the competent departments of various industries, there is even the phenomenon of cross-repeat, inconsistent requirements and incomplete coverage of emergency management standards in different fields for the same element. In addition, the following problems exist in the emergency management standards system:

(1) Emergency management standards and laws, regulations and policy documents are not closely linked. Standards such as laws and regulations, policy documents, an important part of

the support for laws and regulations, policy documents should be inconvenient to refine the technical and other content to further standardize. However, in practice, on the one hand, although some of the existing standards can support the corresponding laws and regulations, and policy documents, but are not fully cited; on the other hand, can support laws and regulations, and policy documents, the standard text needs to be further improved.

(2) The emergency management "Shenzhen standards" system needs to be improved. At present, emergency management standards exist at a low level of technology, quantifiable operational content is small, the standard age and can not meet the needs of the current stage of production safety, and even the absence of such phenomena.

(3) emergency management standards application level needs to be further improved. Part of the emergency management standard content interpretation inconsistencies and other phenomena, so that enterprises are at a loss, it is difficult to implement, and at the same time to bring confusion to the supervision and enforcement of production safety.

(4) the standardization level of emergency management at the grassroots level needs to be further improved. At present, the reform of emergency management institutions has yet to be further extended to the grassroots, due to the formation of the emergency management department not long ago, the grassroots in the comprehensive security, risk prevention and other aspects of the standardization of emergency management is relatively weak, becoming a constraint on the enhancement of emergency management capabilities of the shortboard.

(5) The level of advanced internationalization of emergency management standards needs to be improved. At present, the internationalization level of Shenzhen's local emergency management standards is relatively low and needs to be further aligned with international standards, and there is still a gap in the requirements for Shenzhen to build a modernized, internationalized and innovative city in 2025.

(6) Emergency management standard in scientific research institutions and talent training needs to be strengthened. The cooperation mechanism for establishing emergency management standards with relevant colleges and research institutes needs to be further improved, and there is a lack of emergency management standardization professional talent team.

3 The current situation of foreign emergency management standardization and the experience that can be drawn on

The international standardization organization ISO and developed countries actively promote the standardization of emergency management, to give full play to the role of standards to support emergency management. ISO/TC 292 (security and resilience standardization technical committee), is the integration of the January 2015 ISO/TC 223 "public security" (social security) committee, ISO/TC 247 "fraud countermeasures and controls" (fraud countermeasures and controls) committee and ISO/PC 284 "public security" (security) committee, the main scope of work of this technical committee covers the improvement of public safety and resilience of the standardization field[7-8].

Emergency legislation in the United States began in the early 1970s, and through continuous inheritance and development, it has established a legal system based on federal law, federal

regulations, executive orders, rules and standards, which effectively eliminates the drawbacks of unclear responsibilities and inefficiency among government departments and between the federal government and the state government[9], and has formed a system that covers risk assessment, construction of emergency response facilities, emergency command, and emergency communication services, standardized emergency management system， emergency rescue technologies and methods, emergency rescue team construction, emergency rescue personnel management, and emergency rescue signs[10]. In addition, the United States has developed the National Incident Management System (NIMS), which effectively promotes all levels of government, nongovernmental organizations (NGOs), and the private sector to work together to prevent, protect against, mitigate, respond to, and recover from critical incidents[11-12]. To further integrate national homeland security standards, the Department of Homeland Security and the American National Standards Institute (ANSI) jointly led the establishment of the Homeland Defense and Security Standardization Collaborative (HDSSC) to develop a homeland security standards system. In the homeland security standards system, the relevant standards are divided into four categories: threat, emergency preparedness and response, border and transportation, and information analysis and infrastructure protection[13], which corresponds to the departmental division of responsibilities of the Department of Homeland Security and is conducive to a clear division of labour and comprehensive development of standardization work. In addition, the U.S. has implemented a voluntary Emergency Management Accreditation Program (EMAP) and developed a series of emergency management standards covering hazard identification, risk assessment and consequence analysis, hazard mitigation, prevention, incident management, resource management, mutual aid and logistics, and communication and alerting, which are mainly used to evaluate and certify EMAP for federal, state, and local emergency management programs[14-16].

Japan adheres to "legislation in force" in disaster prevention and response and has established a comprehensive legal system for emergency management, with more than 200 laws and regulations related to emergency management (disaster prevention, relief, and state of emergency)[17]. Among them, the Basic Law for Disaster Countermeasures (1961) is the fundamental law for disaster prevention, disaster response, and post-disaster reconstruction[18]; through a series of laws and regulations such as the Agreement on Mutual Assistance of the Fire and Self-Defense Forces in the Event of a Large-Scale Disaster, a mechanism for cross-regional collaboration and emergency rescue by the fire, police, and Self-Defense Forces has been established, and the unity of command and division of labor between the central government and the local government, as well as between the departments, has been strengthened and division of labour[19].

The experience of foreign emergency management standardization work can be summarized in the following aspects: the construction of an emergency management standard system, based on risk assessment, covering the whole process before, during and after the event; the form of emergency management standardization, government regulations and system documents as a general framework, standards as specific support; the characteristics of emergency management standardization, based on the type of business or disaster, the establishment of an organic integration of emergency management standard system, to achieve the emergency categories of various types of emergency response.

4 Risk Characterization of Shenzhen

4.1 Safety in the field of production

Shenzhen City, industrial, mining and trade sector risk is mainly concentrated in the hazardous chemicals industry enterprise fire and explosion and poisoning and suffocation, dust explosion enterprise fire and explosion, battery enterprise fire and explosion, clean plant enterprise fire, coating drying enterprise fire and explosion and poisoning and suffocation, fire and explosion and poisoning and suffocation of limited space enterprise fire and explosion and poisoning and suffocation of ammonia refrigeration enterprise fire and explosion and poisoning and suffocation, etc.[20]; the fire sector risk is concentrated in the following areas High-rise building fires, urban village fires, fires in small hotels, restaurants and entertainment establishments, fires in crowded places, comprehensive transportation hub fires, etc.; Transportation risks are mainly concentrated in rail transit operation safety, road traffic safety (trucks, dump trucks, tourist chartered buses (shuttle buses), electric vehicles), etc.; Construction risks are mainly concentrated in the field of construction engineering on building construction, collapse of various types of buildings (structures), collapse of buildings around culverted rivers and drainage pipes, etc.[21].

4.2 Natural disasters

Shenzhen City is located in the south of the Tropic of Cancer, in the tropical and subtropical transition area, near the South China Sea, with typical subtropical oceanic monsoon climate characteristics, coupled with the location of the water cycle is extremely active in South China's humid climate zone, accompanied by the impact of climate change and rapid urbanization, typhoons, rainstorms, thunder and lightning, urban flooding, mudslides, landslides, ground subsidence, storm surges, waves, forest fires and other natural disasters Events occur frequently, characterized by many types of disasters, long disaster period, high frequency of occurrence and heavy disaster[22-24].

5 Construction of Shenzhen emergency management standard system framework

Based on the practice of emergency management in Shenzhen, combined with the analysis of risk characteristics of Shenzhen and foreign experience, the Shenzhen emergency management standard system framework is proposed, as shown in Figure 1.

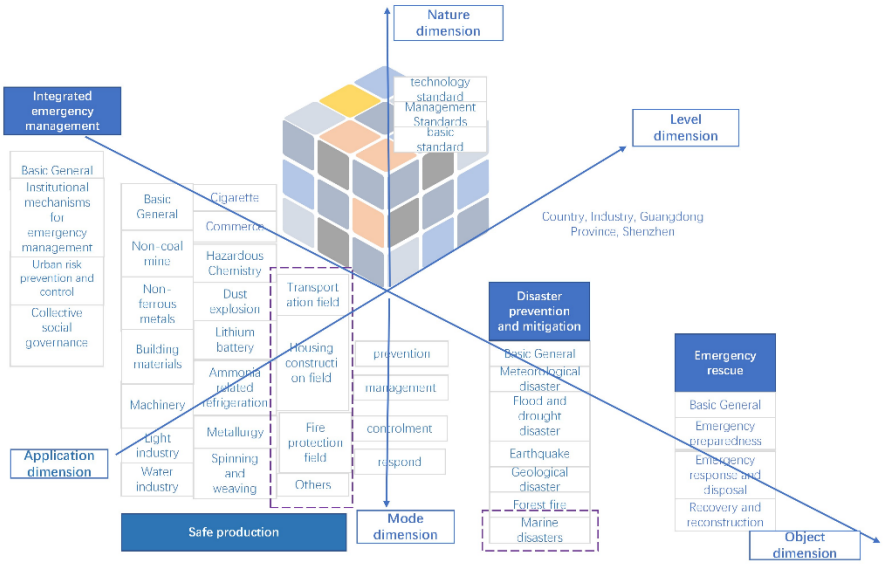

Fig. 1. Five-dimensional thinking model of emergency management standard system
Note: For standards related to relevant professional fields other than this emergency management standard system, you need to refer to the standard system of the relevant industry fields. Other industry-standard systems as a necessary supplement to the emergency management standard system, and jointly guide the emergency management work in Shenzhen.

The thinking model of the emergency management standard system is built around five dimensions: object dimension, nature dimension, level dimension, application dimension and mode dimension.

Among them, the object dimension includes emergency management, safety production, disaster prevention and mitigation, and emergency rescue; the nature dimension includes basic standards, management standards and technical standards; the level dimension includes national standards, industry standards, Guangdong Province standards, Shenzhen City standards, etc.; the application dimension is further divided for different object dimensions, as shown in Figure 2 below.

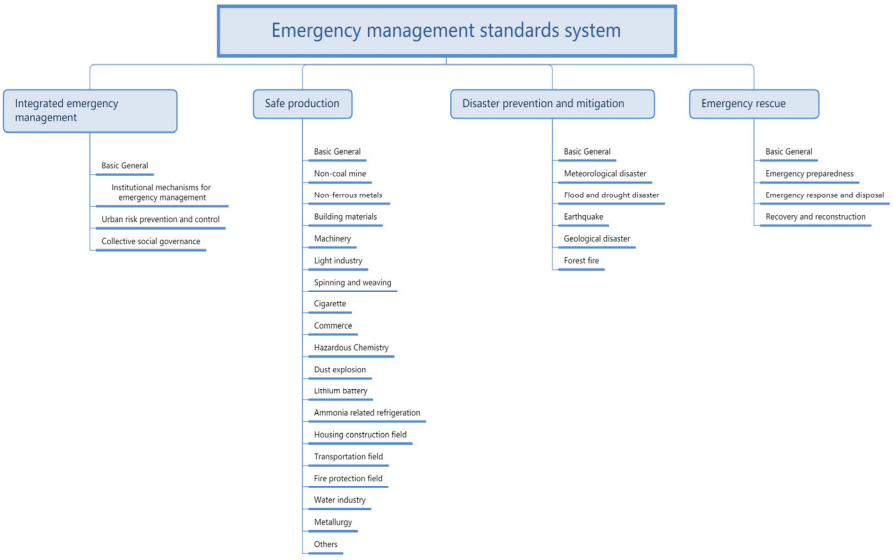

Figure 2 Emergency management standards system

Comprehensive standards for emergency management mainly include basic general standards for emergency management terminology involved in various fields or links of emergency management such as production safety, disaster prevention and mitigation, and emergency rescue, standards for the "Emergency response covers all hazards" emergency management system and mechanism, standards for urban risk assessment, modernization of the emergency management system and capacity, construction of model cities for safe development, construction of resilient cities, construction of a comprehensive platform for emergency management, information management of emergency management resources, comprehensive rescue and science education bases, and standards for social co-governance such as education and training systems for all, and construction of emergency culture.

Production safety standards mainly include basic general standards such as terminology, and basic, technical or management standards related to industry, mining, commerce and trade and key regulatory fields (including terminology, design and construction, risk management, hidden danger investigation and management, education and training, equipment and facilities, production or storage and transportation safety, monitoring and early warning, and informatization construction).

Disaster prevention and mitigation standards mainly include basic general standards such as terminology, and basic, technical or management standards for meteorology, water and drought, earthquakes, geology, forest fires, etc. (including terminology, planning and design, risk census, disaster risk assessment, hazard identification and management, education and training, disaster monitoring, early warning and forecasting, disaster investigation and assessment, and informatization construction, etc.).

Emergency rescue standards are mainly formulated around the whole cycle of emergency rescue, including basic general standards such as terminology, standards for emergency preparedness

such as emergency planning, organization and teams, training and exercises, capacity assessment, individual protective equipment, emergency supplies and equipment, emergency sites and infrastructure, monitoring and early warning, and informatization, and standards for information reporting and dissemination, emergency command and coordination, emergency relief and emergency response, and emergency site management and control.

6 Shenzhen emergency management standard system construction action recommendations

6.1 Sound Emergency Management Standard coordination system

First, establish a sound emergency management standardization technical organization. Promote the construction of emergency management standardization technical committees, and strengthen the overall guidance and standardized management of emergency management standard formulation, revision, implementation and evaluation. Formulate Shenzhen Emergency Management Standardization Management Measures to guide and regulate the efficient operation of the Standardization Technical Committee.

Secondly, strengthening the top-level design of the emergency management standard system. To establish and improve the emergency management standard system that is "structurally complete, hierarchically reasonable, open and compatible", we will improve the emergency management standard system covering production safety, disaster prevention and mitigation, and emergency rescue, strive to be compatible with the existing standard system framework in various industrial fields, and buttress the construction of the national emergency management standard system to realize the synergy of development planning, technology and rules, to provide the national emergency management system with the most efficient and effective emergency management standard system. rules in synergy with each other, and provide services for the modernization of the national emergency management system and governance capacity.

Thirdly, it is to improve the synergy between emergency management standards and laws and regulations. Understand in-depth the actual needs of emergency management, and establish a mechanism for analyzing and identifying the needs of standards supporting local laws and regulations on emergency management. Priority is given to the requirements of the current local laws and regulations on emergency management in Shenzhen, and the corresponding supporting standards are formulated. At the same time, a consultation mechanism is set up in the process of proposing standards to solicit the opinions of the law and regulation-making organizations and give full play to the role of standards as the technical support for the implementation of supporting documents of laws and regulations.

Fourth, improve the coordination mechanism of emergency management standardization and revision departments. Improve the emergency management standards revision of multi-departmental consultation and study, synergistic mechanism, around the unified emergency management standard system, combined with the existing standard system of various industry sectors, to create departments with responsibilities for supervision and management of production safety mutual support, complement each other, and jointly promote the improvement of the emergency management standard system, to achieve the effective convergence of the emergency management standards of various departments. Establish consistency requirements

for management objects that may involve the responsibilities of multiple departments, realize the effective convergence of management mechanisms and processes, technical requirements and methods, and avoid problems such as intersection, duplication, contradiction and incomplete coverage of standards in various industrial fields. Strengthen the linkage with the relevant national and provincial standardization committees and the Shenzhen Municipal Market Supervision and Administration Department, and gradually promote the local standards to be upgraded to industry standards and national standards, or take the initiative to actively participate in the formulation and revision of national and industry standards.

Fifth, encourage social forces to participate in the development of emergency management standards. In the process of proposing and formulating emergency management standards, widely solicit social opinions, and encourage scientific research institutes, industry associations, production and operation units and individuals to participate in the standardization of emergency management by the law, and provide intellectual support for standardization work.

6.2 Create an emergency management "Shenzhen standard" system

First, to strengthen the key industry sectors and key links of emergency management standardization. Pay close attention to the risk assessment, and accident analysis revealed in the key industry sectors and key links in the accident and disaster, natural disasters and other aspects of emergency management standardization short board problem. Improve the system of investigation, assessment review and improvement of accidental disasters and natural disasters, and introduce standards and specifications for the investigation and assessment of prevention and preparedness, monitoring and early warning, disposal and rescue, and recovery and reconstruction of each link.

Secondly, it will strengthen the standardization of key projects in emergency management. Improve the natural disaster defence engineering standards for meteorological disasters, water and drought disasters, forest fires, geological disasters and other natural disasters, focusing on promoting the preparation and revision of standards for grass-roots disaster protection projects. Strengthen the construction of standards for disaster prevention and resilience of key facilities such as comprehensive hubs, subways, bridges and tunnels, underground shopping malls, underground garages and sunken interchanges, improve monitoring and early-warning technical specifications and standards, and enhance the ability of important places to prevent floods and typhoons. Improve the emergency protection standards for major security risks. Improve the seismic defence standards for schools, hospitals and high-rise residential communities.

Third, strengthening the standardization of grass-roots emergency management. The street grass-roots emergency management standardization construction is an important content to improve the emergency management system and governance capacity in the new period and promote the street emergency management institutions and responsibilities, team building, basic security, organizational operation and other standardized construction. Through the standardization and revision, strengthen the standardized construction of street emergency management capacity with "a team, a mechanism, a plan, a team, materials, training, and exercises" as the main content, and support the construction of the "Emergency response covers all hazards" grass-roots comprehensive emergency management system.

Fourth, to promote the preparation of standards in the field of the new emergency management industry. In the form of standards to make up for the short board of safety production

management in emerging industry fields, and promote the gradual standardization of safety management in emerging industry fields. For areas where the competent departments are not clear or where there is a crossover of responsibilities, it is recommended that joint departmental preparation be adopted to promote the gradual improvement of standards in the relevant areas.

6.3 Improve the level of application of emergency management standards

First, carry out pilot demonstrations of emergency management standards. Select typical industry sectors, regions or enterprises to carry out pilot demonstrations of emergency management standards, and promote the continuous improvement of the standardization level of Shenzhen's emergency management by leading the way.

The second is to strengthen the implementation and evaluation of emergency management standards. By the principle of "who puts forward the project, who organizes the publicity and implementation", implement the responsibility of standardized publicity and assessment and supervision regularly. Standardize the management of standard interpretation authority and standard technical consultation activities, and respond to social concerns promptly. Develop emergency management safety standards, safety manuals, and emergency management teaching materials such as law enforcement priorities and norms by industry and speciality, increase the training of cadres, unify the understanding and application of emergency management standards, and promote the standardization of emergency management to become an important tool for government management, social governance, and corporate governance. It has also improved the mechanism for regular evaluation of emergency management standards, quantified the system of indicators for evaluating emergency management standards, and promptly identified problems such as standards not adapting to development needs and the existence of gaps.

6.4 Promoting emergency management standards to benchmark with international advanced levels

Strengthen the translation of important standards in the field of emergency management into foreign languages, and increase the efforts to adopt international advanced standards. Taking into account the risk characteristics of Shenzhen, sort out some international advanced regional or city-related standards that are highly relevant to the safe development of Shenzhen city, and promote the convergence of individual emergency management standards in some fields with international standards on a pilot basis.

6.5 Strengthen mutual recognition and interconnection of emergency management standards in Guangdong, Hong Kong and Macao Greater Bay Area

Strengthening the formulation and revision of standards for regional coordination in emergency management, enhancing the formulation and revision of standards for joint prevention and control of major risks, promoting the formulation and revision of standards for cross-regional and cross-basin joint risk and hidden danger surveys, improving the system of joint emergency response plans, perfecting the formulation and revision of standards for joint command, notification of disasters, resource sharing, cross-domain rescue, comprehensive emergency response drills, etc., enhancing the convergence of mutual assistance and deployment among the standards of Guangdong, Hong Kong and Macao, and progressively harmonizing the processes of emergency management workflows and operational standards, to promote the

construction of a coordinated and linked-up mechanism for the Guangdong, Hong Kong and Macao region.

6.6 Strengthen the cultivation of emergency management standardization personnel

Strengthen the protection of emergency management standardization personnel, establish a qualification system for emergency management standardization personnel, and enhance the professional quality of emergency management standardization personnel. Strengthen the construction of emergency management disciplines, promote the inclusion of emergency management standardization into vocational education and continuing education, gradually incorporate it into general higher education, and carry out pilot projects for the integration of professional and emergency management standardization education. Give full play to the role of emergency management standardization experts in scientific and technological decision-making and consulting, and build an emergency management standardization think tank. Strengthen the construction of a team of emergency management standardization managers at the grass-roots level.

7 Conclusions

There are still some deficiencies in Shenzhen's emergency management standardization work, the emergency management standard coordination mechanism still needs to be further improved, the emergency management "Shenzhen standard" system needs to be sound, the level of application of emergency management standards needs to be further improved, emergency management standards urgently need to be benchmarked against the international advanced level, and the mutual recognition of the Guangdong-Hong Kong-Macao Greater Bay Area emergency management standards needs to be improved. The interconnection mechanism of Guangdong, Hong Kong and Macao Greater Bay Area emergency management standards needs to be improved, and the cultivation of emergency management standards talents needs to be strengthened.

Given the above problems, based on the risk characterization of Shenzhen, drawing on relevant tests abroad, combing and analyzing the current situation of Shenzhen's safety production, disaster prevention and mitigation, and emergency rescue standards, we will construct the framework of Shenzhen's emergency management standard system, including:

(1) Comprehensive standards for emergency management, including basic general standards, standards for emergency management systems and mechanisms, standards for urban risk prevention and control, and standards for social co-governance.

(2) Production safety standards, including basic general standards, industrial, mining and commerce and key regulatory areas related to basic, technical or management standards.

(3) Disaster prevention and mitigation standards, including basic general standards, meteorological, water and drought, earthquake, geological, forest fire and other basic, technical or management standards.

(4) Emergency rescue standards, including basic general standards, emergency preparedness standards, emergency response and disposal standards, and recovery and reconstruction standards.

In promoting the standardization of emergency management in Shenzhen, it is suggested to carry out the following work:

(1) Improve the emergency management standard coordination system. Promote the construction of the emergency management standardization technical committee, strengthen the top-level design of the emergency management standard system, improve the synergy between emergency management standards and laws and regulations, improve the coordination mechanism of the emergency management standard making and revising departments, and encourage social forces to participate in the development of emergency management standards.

(2) Create a "Shenzhen standard" system for emergency management. It will strengthen the preparation of standards for key industries and key links in emergency management, enhance the preparation of standards for key projects in emergency management, strengthen the standardization of emergency management at the grassroots level, and strengthen the formulation of standards for emergency management in the field of new industries.

(3) Improve the application level of emergency management standards. Carry out pilot demonstrations of emergency management standards, and strengthen the implementation and evaluation of emergency management standards.

(4) Promote the standardization of emergency management standards to an internationally advanced level. Pilot the advancement of individual emergency management standards in some areas to international standards.

(5) Strengthen the mutual recognition and interconnection of emergency management standards in Guangdong, Hong Kong and Macao. Strengthen the formulation and revision of emergency management standards for regional coordination, and enhance the formulation and revision of standards for joint prevention and control of major risks.

(6) Increase the cultivation of emergency management standardized personnel. Establish a qualification system for emergency management standardization personnel, strengthen the construction of emergency management disciplines, and give full play to the role of emergency management standardization experts in scientific and technological decision-making and consultation.

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