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Research on Working Mechanism of Investigation and Treatment of Hidden Hazards in Construction Enterprises

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Abstract: *Construction site in construction industry is characterized by short construction period, high risk and many potential hazards, which are very prone to safety production accidents. This paper establishes the working mechanism of hidden danger investigation and governance, innovates the model of hidden danger investigation and governance, clarifies the main responsibilities of participating units, determines the processes and measures of hidden danger investigation and governance, establishes an effective hidden danger investigation and governance mechanism which integrates government supervision, enterprise self-examination and social supervision, and effectively improves the level of enterprise safety supervision, so as to provide theoretical support and practical experience for relevant enterprises and units to draw on.*

Keywords: *Construction; Investigation of hidden dangers; Working mechanism*

1. Introduction

With the rapid development of our national economy, it provides good development opportunities and endogenous power for the construction industry. In recent years, the economic development of China's construction industry has maintained a steady growth trend, with fixed investment of 54.4547 trillion yuan in 2021, an increase of 4.9% over the same period in 2020, including infrastructure of 36.2877 trillion yuan, an increase of 0.4% over the same period in 2020; The total construction area of the construction industry in 2021 is 15.75495 million square meters, an increase of 5.1% over the same period in 2020. New construction area of 492097 million square meters is slightly lower than that in 2020, but the national total construction output increased by 5.8% year-on-year in 2020, breaking through 26 trillion yuan for the first time, accounting for 26.04% of the gross domestic product in 2020[1].

However, as one of the five high-risk industries, construction safety accidents still occur frequently. According to the statistics of the State Bureau of Statistics, the Ministry of Housing and Urban-Rural Construction, in 2021, 721 accidents and 803 deaths occurred in the production safety of housing and municipal works in China, an increase of 27 cases compared with the number of accidents in 2007, and the number of deaths basically remained unchanged, all of which were more than 800. There are 15 major accidents and more, with 65 deaths[2]. The situation of safety in production is severe and complicated. As shown in figure 1 and figure 2.

In this context, on Oct. 6, 2016, the Security Committee of the State Council issued Opinions on the Implementation of Guidelines for Containing Severe and Extraordinary Accidents to Construct a Dual Preventive Mechanism for Graded Control of Safety Risks and Investigation and Treatment of Potential Hazards [3]. On December 18, the Opinion of the State Council of the CPC Central Committee on Promoting the Reform and Development in the Field of Safety Production was issued, in which the Opinion clearly calls for the construction of a double preventive working mechanism of graded risk control and investigation and treatment of potential hazards to strictly prevent the occurrence of production safety accidents due to the evolution and escalation of risks [4]. The newly revised Safety Production Law of 2021 clearly points out that it is necessary to construct a dual prevention mechanism of graded management and control of safety risks and investigation and treatment of potential hazards, improve the mechanism of risk prevention and resolution, improve the level of safety production and ensure safety in production [5].

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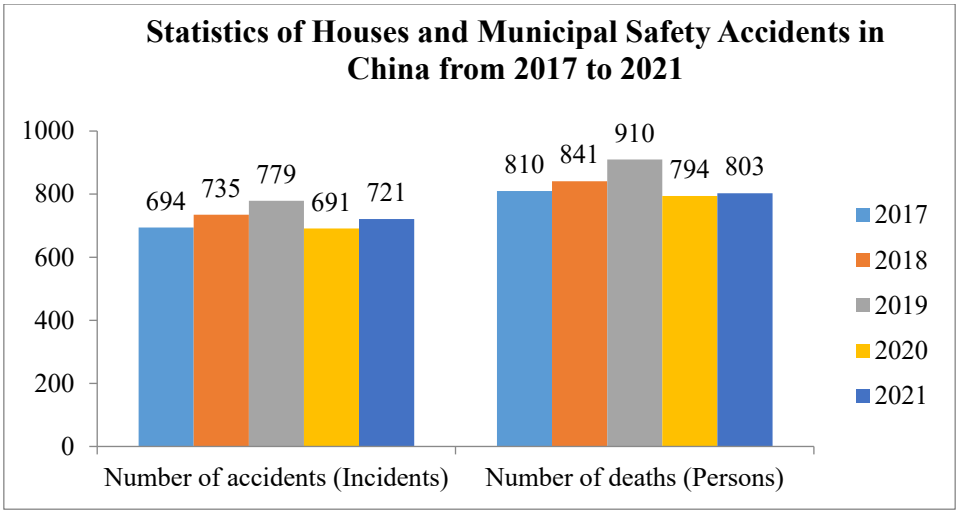

Figure 1: Statistical diagram of domestic and municipal safety accidents from 2017 to 2021

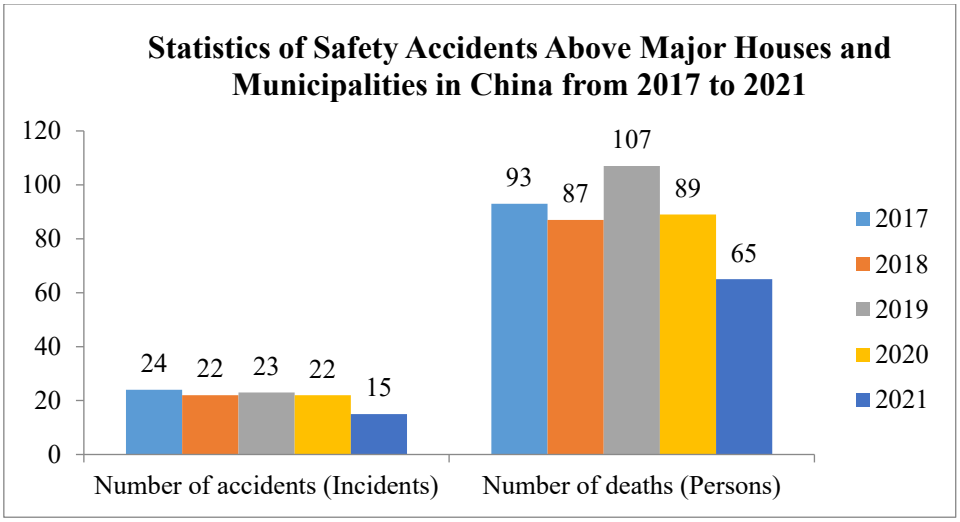

Figure 2: Statistical diagram of large and above safety accidents of houses and municipalities in China from 2017 to 2021

For foreign research, the key to the investigation and management of hidden dangers lies in human management, especially in the safety management of DuPont enterprises. The core concepts of DuPont safety management concept [6] are as follows:

(1) Accident Main Cause Structure Theory

96% of people's unsafe behavior is the main factor of accidents, and it can be avoided by measures. 4% of the unsafe state of things is the secondary cause. The essence of things is safe. The unsafe state is also an indirect human behavior. Human factors are the most important cause and the most difficult measure to control.

(2) Accident Pyramid Theory

According to a lot of data statistics, the proportion of unsafe behaviors of dangerous events: minor accidents: serious injuries: fatal accidents is 30,000:12,998:302:29, which means that as long as there are 30,000 dangerous events, there are 29 fatal accidents lying dormant, i.e. accidents have their own inevitability.

(3) Accident economics theory

The economic loss of an accident is only one corner of the water above the iceberg. Most of the economic loss comes from the unsafe state of a large number of things and unsafe human behaviors. We often ignore those potential indirect economic losses that have not yet occurred or are not well measured, but they occupy a large part.

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From the perspective of domestic research, the research carried out by various scholars in China is different. For example, in 2012, in Definition and Investigation of Accident Potential Hazards in Construction Industry [7], Xi Huihuang defined the potential hazards in construction process as physical hazards and behavioral hazards, listed the main potential hazards existing in construction work and established a safety accident potential detection system. In 2015, Liu Xiaogang pointed out in Discussions on Safety Management of Construction Sites that hidden dangers in construction process [8] are mainly manifested in unsafe behaviors of human beings and unsafe status of objects. In 2016, Li Hongqing introduced the investigation and management information system of security hazards, including the basis and basic principles of information system construction, the interface and function analysis of information system, the problems and solutions in the process of information system discovery, taking the construction and application of security hazard investigation management system and information system of Guangzhou Metro Construction Project as an example in Research and Practice on Investigation and Treatment of Security Hazards of Urban Rail Transit Project [9]. In 2016, Teng Zhe pointed out in Research on Association Rules of Unsafe Behaviors of Metro Construction Workers [10] that there are such problems as low efficiency of manual investigation method, low execution of responsibility system and formality of standardized management in the investigation and treatment of hidden dangers of metro operation companies. In 2017, Zhang Pin pointed out in Research on Construction Safety Hidden Hazards Management Based on Accident Cause Theory [11] that from the perspective of hazard sources, he carried out research on construction safety hidden hazards investigation and safety evaluation method, summarized the main hazard sources of construction enterprises and construction sites, and analyzed the methods for evaluating concrete construction safety hidden hazards. In Coal Mine Safety Production Forewarning Based on Improved BP Neural Network [12], Ying describes the possible precursors of risk factors based on the structure of Semantic Network, and proposes a case representation and retrieval method to analyze security risks based on case reasoning (CBR). In On Investigation and Treatment of Potential Safety and Quality Hazards of Rail Transit Project [13], Zhou Yan made a brief introduction in theory on the main accident characteristics such as object strikes, collapses, machine tool injuries and high drops during Subway construction, including finding problems at the source, establishing a potential hazard management system, organizational structure, potential hazard investigation and assessment, and potential hazard investigation practice, in which there is no specific description in terms of specific application; Cai Deutschland and others put forward Heinrich's safety rule in Practice of Investigating and Addressing Security Potential Hazards in Xi'an Subway Construction [14] taking Xi'an Subway as background; Two attributes of investigation are incomplete investigation and untimely treatment, three-inspection system of "daily inspection, weekly inspection and monthly inspection", four-discrepancy principle and five implementation, which provides conceptual and theoretical thinking and reference for the investigation of hidden dangers in subway construction; Gu Xuejing analyzed the shortcomings of the current hidden danger management system in Beijing Subway [15], constructed a closed-loop management framework for the hidden dangers of subway operation, classified and graded the hidden dangers for the design of subway operation, formulated the management responsibilities for the hidden dangers of subway operation, and designed the hidden danger process for five stages of hidden dangers, thus achieving the closed-loop effect.

2. Research on hidden danger investigation and management theory

2.1 Basic Concepts of Hidden Hazards

The word "hidden danger" first appeared in Xu Wenhua Biography of Ming History. In Modern Chinese Dictionary, "hidden danger" is interpreted as "hidden danger". Accident Hidden Risk [16] in the Dictionary of Modern Labor Relations is defined as: various potential risk factors that can cause personal injury in equipment, facilities, plant, environment, etc. of an enterprise. In the Occupational Safety and Health Terminology (GB/T15236-1994), Accident Potential [17] is defined as the "dangerous state of things that can lead to accidents, unsafe human behavior and management deficiencies." In the Regulations on the Management of Major Accident Potential Hazards promulgated by the former Ministry of Labor in 1995, the potential accident hazard was defined as "the unsafe state of workplaces, equipment and facilities, unsafe behavior of human beings and defects in management".

In Interim Provisions for Investigation and Treatment of Potential Hazards in Safety Production (Decree No. 16 of the General Administration of Safety Supervision), issued in 2008, the definition of potential hazards in safety production accidents (abbreviated as potential hazards in accidents) refers to that the production and operation units violate the provisions of laws, regulations, standards, regulations and safety production management systems in safety production or that there is a dangerous state of

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things which may cause accidents in production and operation activities due to other factors. Unsafe human behavior and management deficiencies.

According to comparative analysis, the definition of "hidden danger of accident" is included in the definition of "dangerous and harmful factors". The dangerous state of the things that may cause the accident, the unsafe behavior of the human being and the defects in management are all the reasons or conditions that can cause harm to the human body. According to the above definition of Derivative Hazardous Factors, potential accident hazards show the characteristics of eliminability, derivation and temporary of Derivative Hazardous Factors. When determining control measures or considering changes to existing ones, potential accident hazards are similar to derivative hazards and harmful factors to consider reducing risks in the following order: elimination, substitution, engineering control measures, signs, warnings and management control measures, and individual protective equipment.

Therefore, for the construction project, the potential accident is an unfavorable factor that threatens the life and safety of production and construction personnel or causes property loss during the construction process, i.e. the factor that leads to the escalation of risk. Accident hidden danger may lead to safety accidents, which are caused by out-of-control potential danger. Accident is the visual manifestation of construction accident hidden danger.

2.2 Basic concept of hidden danger investigation

Potential hazard investigation generally refers to a special inspection of the places or processes where safety hazards occur frequently on the basis of identifying existing safety hazards, and its scope includes all places, environment, personnel, equipment, facilities and activities related to production and operation units [18].

From the current situation of hidden danger investigation, most enterprises adopt the way of safety inspection to carry out investigation. They should use the way of safety inspection to carry out hidden danger investigation. The forms of safety inspection include safety inspection, daily safety inspection, special inspection, seasonal inspection, holiday inspection, etc. [19].

2.3 Basic concept of hidden danger investigation and management

Potential hazard management refers broadly to activities or processes to eliminate or control potential hazards. In a narrow sense, hidden danger management refers to the dynamic process of selling or rectifying hidden danger by taking corresponding technical measures and management measures according to the identified hidden danger. The hidden danger management must implement responsibilities, measures, funds, time limits and plans to realize closed-loop management of hidden danger management [20].

3. Research on hidden danger investigation and treatment method of Construction Engineering

3.1 Responsibility for hidden danger investigation and management

3.1.1 Construction Unit

(1) Establish and improve the hidden danger investigation and governance system, formulate a list of hidden danger investigation and governance that conforms to the actual enterprise, clarify and detail the matters, contents and frequency of hidden danger investigation, and implement the responsibilities one by one, so as to promote all staff to participate in the independent detection of hidden dangers;

(2) Establish a special system for the use of funds to ensure the investment required for investigation and treatment of potential accident hazards;

(3) Strengthen the investigation of potential hazards at places, links and locations with major risks, and report the investigation and treatment of potential hazards through the investigation and management information system interlinked with government departments through the whole process;

(4) For the major potential accidents found in investigation, the construction unit shall be informed in time, and strict hidden danger treatment scheme shall be formulated and implemented to achieve the five implementation of responsibilities, measures, funds, time limit and plans, so as to realize closed-loop management of hidden danger investigation and treatment.

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3.1.2 Investigation Units

(1) Establish and improve the hidden danger investigation and management system, define the matters and contents of hidden danger investigation, and perform the duty of safety in production in post during the investigation;

(2) When carrying out reconnaissance work, the reconnaissance unit shall strictly implement the operation regulations, systematically investigate hidden dangers and take measures to ensure the safety of various pipelines, facilities and surrounding buildings and structures.

3.1.3 Design Units

(1) Establish and improve the hidden danger investigation and treatment system, define the matters and contents of hidden danger investigation, and perform the duty of safety production in post during the design process;

(2) Design units shall design in accordance with laws, regulations and mandatory standards for engineering construction, and investigate potential design hazards from the source to prevent production safety accidents due to unreasonable design;

(3) The design unit shall consider the needs of construction safety operation and protection, indicate the potential hazard names in the design documents for key parts and links involved in construction safety, and provide guidance for preventing production safety accidents.

3.1.4 Construction Units

(1) Establish and improve the accident hidden danger investigation and management system, define the responsibility, content, cycle, monitoring and control measures of accident hidden danger investigation and management, and establish and implement the system of hidden danger investigation and control responsibility from the main person in charge to each practitioner step by step;

(2) Establish a special system for the use of funds to ensure the investment required for investigation and treatment of potential accident hazards;

(3) Conduct investigation of potential accident hazards for practitioners, conduct safety education and technical submission, and truthfully inform practitioners of various hazards sources, preventive measures and emergency measures in their workplaces and jobs;

(4) Judge the potential accident hazards detected according to national standards and relevant codes, and take corresponding technical and management measures to eliminate them in time;

(5) Inform and publicize the investigation and treatment of potential accident hazards to practitioners through information bulletin boards, company websites, various reports, etc.

(6) Establish an incentive system for reporting and reporting potential accidents, encourage and motivate employees to discover and eliminate potential accidents, and encourage workers to report accidents. Material rewards and commendations shall be given to the successful personnel who discover, eliminate and report potential dangers of accidents.

3.1.5 Supervisory Units

(1) Establish and improve the hidden danger investigation and management system, confirm the responsibility, content, cycle, monitoring and control measures of the accident hidden danger investigation and management, and promote all staff to participate in the hidden danger investigation;

(2) Conduct daily hidden danger investigation on construction site, inform the construction unit of the results of hidden danger investigation in time, define the responsible person and rectify regularly;

(3) For the treatment of hidden dangers of construction units, a special person shall be sent to review and verify the situation within the specified time limit to complete the closed-loop management of hidden dangers investigation and rectification treatment;

(4) Improve the reporting mechanism for potential hazards investigation and management, and report the potential hazards in the process of investigation to the construction unit in time.

3.1.6 Third Party

(1) The third party shall establish and improve the hidden danger investigation and management system, strengthen the supervision and assessment of the hidden danger investigation and management, and ensure the effective implementation of the system;

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(2) The third party shall have the right and responsibility to deal with the potential safety hazards investigated during the work, and shall inform the construction unit of the nature and location of the potential hazards in time and provide guidance;

(3) For the hidden dangers in the duties investigated by the construction unit, the third party shall implement rectification and complete closed-loop management in accordance with relevant standards and standards.

3.1.7 Work groups

(1) Work groups should establish a hidden danger investigation and treatment system, with the team leader as the first person responsible for the investigation and treatment of hidden dangers in the group;

(2) Before daily operation, the working groups shall carry out hidden danger investigation, which can eliminate the completed hidden danger immediately, and take technical and management measures to eliminate it immediately, so that construction can be carried out only after safety has been confirmed; Potential dangers requiring shutdown and rectification shall be constructed after rectification has been completed;

(3) During the operation, the hidden dangers found by the construction unit and the construction unit should be remedied and closed-loop rectification should be completed.

3.2 Contents of hidden danger investigation and treatment

3.2.1 Construction Unit

(1) Potential hazards of production and operation units'qualification certificates

The potential hazards of production and operation unit qualification certificate mainly refer to the problems and hidden dangers of non-compliance with laws and regulations existing in production and operation unit in aspects of safety production license, fire acceptance report and safety evaluation report.

(2) Potential hazards of safety management organization and personnel

The hidden dangers of production safety management organization and personnel mainly refer to that production and operation units have not set up production safety management organization or equipped full-time and part-time production safety management personnel according to their own production and operation characteristics and relevant laws, regulations or standards.

(3) Safety production responsibility system

According to relevant laws, regulations or standards, establish, improve and perfect the responsibility system for production safety suitable for the production and operation characteristics of the unit. Must cover all staff and all departments, truly horizontal to side, vertical to the bottom, no omissions.

(4) System construction

Mainly investigate the formulation and implementation of our unit's accident hidden danger investigation and treatment system;

(5) Education and training

Investigate the education and training on safety in production of employees in our unit to ensure that the training hours meet the requirements;

(6) Special Personnel

Check the certification of special operators in our unit;

(7) Equipment and facilities

Investigate the production equipment and safety facilities, equipment operation, daily maintenance, maintenance, inspection and inspection of our unit;

(8) Hazardous Locations

Investigate the safety management of places with high risk factors and hazardous operations in our unit;

(9) Labor protection

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Investigate the preparation, wear and use of labor protection articles for employees in our unit and whether the quality of labor protection articles meets the legal requirements;

(10) Hazardous Sources

Investigate the situation of major hazards existing in our unit, and formulate effective control measures and implementation;

(11) Emergency Disposal

Investigate the formulation of emergency rescue plan, drilling, construction of emergency team and distribution of emergency rescue materials in our unit;

(12) Other matters

Other matters that should be investigated regularly.

3.2.2 Investigation Units

(1) System construction

Investigation of the establishment and implementation of the unit's hidden dangers investigation and governance system;

(2) Equipment and facilities

Investigate the operation status of each equipment and facilities in our unit as well as the daily maintenance, maintenance, inspection and inspection;

(3) Hazardous sources

Whether effective control measures are formulated and implemented for the major hazards existing in the process of investigation and investigation;

(4) Underground pipelines

Setting of underground pipelines and implementation of relocation measures during investigation and reconnaissance;

(5) Other matters

Other matters that should be investigated regularly.

3.2.3 Design Units

(1) System construction

Investigation of the establishment and implementation of the unit's hidden dangers investigation and governance system;

(2) Hazardous sources

Investigate potential hazards in the design process, formulate measures and implement them;

(3) Other matters

Other matters that should be investigated regularly.

3.2.4 Construction Units

(1) Potential hazards of production and operation units'qualification certificates

The potential hazards of production and operation unit qualification certificate mainly refer to the problems and hidden dangers of non-compliance with laws and regulations existing in production and operation unit in aspects of safety production license, fire acceptance report and safety evaluation report.

(2) Potential hazards of safety management organization and personnel

The hidden dangers of production safety management organization and personnel mainly refer to that production and operation units have not set up production safety management organization or equipped full-time and part-time production safety management personnel according to their own production and operation characteristics and relevant laws, regulations or standards.

(3) Safety production responsibility system

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According to relevant laws, regulations or standards, establish, improve and perfect the responsibility system for production safety suitable for the production and operation characteristics of the unit. Must cover all staff and all departments, truly horizontal to side, vertical to the bottom, no omissions.

(4) Emergency management

Emergency management includes emergency organizations and teams, emergency plans and exercises, emergency equipment and facilities and materials, emergency rescue and other aspects.

(5) Safety management of special equipment

Special equipment includes boilers, pressure vessels (including cylinders), pressure pipes, elevators, lifting machinery (in the catalogue), passenger ropeways, large entertainment facilities and special motor vehicles in yards (factories). Such equipment itself and its field management deficiencies, belong to special equipment field management hidden dangers.

(6) Production facilities and processes

Defects in production equipment facilities and processes of production and operation units are called potential hazards of production equipment facilities and processes.

(7) Site environment

The potential environmental hazards of production and operation units mainly include the problems and defects existing in the factory environment, workshop work, warehouse work, hazardous chemical work place and construction site.

(8) unsafe behavior of people

"Three violations" of employees mainly include: violation of operating rules by employees, violation of labor disciplines, violation of operating rules by the responsible person, command employees to carry out work, improper wearing and use of labor protection articles by employees. The potential hazards of operation behavior of employees include "three violations" behavior and personal protective equipment wearing.

(9) Fire control facing electric power

Temporary power consumption and fire safety related issues

(10) Occupational Health

In the special management of occupational hygiene, those involving production and operation units that fail to comply with laws and regulations in safety of occupational hygiene sites are all classified as potential hazards of occupational hygiene site safety.

(11) Related parties

Defects and problems related to on-site management belong to hidden dangers related to on-site management.

(12) Other

Other items to be investigated.

3.2.5 Supervisory Units

(1) Potential hazards of production and operation units'qualification certificates

The potential hazards of production and operation unit qualification certificate mainly refer to the problems and hidden dangers of non-compliance with laws and regulations existing in production and operation unit in aspects of safety production license, fire acceptance report and safety evaluation report.

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The hidden dangers of production safety management organization and personnel mainly refer to that production and operation units have not set up production safety management organization or equipped full-time and part-time production safety management personnel according to their own production and operation characteristics and relevant laws, regulations or standards.

(3) Safety production responsibility system

According to relevant laws, regulations or standards, establish, improve and perfect the responsibility

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system for production safety suitable for the production and operation characteristics of the unit. Must cover all staff and all departments, truly horizontal to side, vertical to the bottom, no omissions.

(4) System construction

Mainly investigate the formulation and implementation of our unit's accident hidden danger investigation and treatment system;

(5) Potential dangers on site

Investigate potential physical hazards of relevant units and implementation of rectification;

(6) Emergency disposal

Investigate the formulation of emergency rescue plan, drilling, construction of emergency team and distribution of emergency rescue materials in our unit;

(7) Other matters

Other matters that should be investigated regularly.

4. Potential danger investigation and treatment process

4.1 Ideas for hidden danger investigation

Investigation of hidden dangers in construction site mainly includes construction party, supervisor, constructor, investigation and design, third party and other investigation modes. This subject mainly carries out investigation of hidden dangers in construction site from the perspective of safety management of construction party, and the same is true of other parties. The safety management organization of the construction party (general contracting unit) shall, by using scientific and professional hazard investigation procedures and methods, cooperate with the corresponding detection equipment, investigate the potential hazards on the construction site, formulate corresponding corrective measures, rectify and eliminate the existing potential hazards on the site, and review and track the rectification results of the potential hazards on the site, so as to achieve the safety management goal of "zero" potential hazards. Eliminate potential safety hazards and safety production accidents in the budding state, and control the safety management level and safety production risks in the construction site within an acceptable range.

4.2 Guiding Ideas for Potential Hazards Investigation

As a front-line unit, the construction unit mainly implements self-inspection in the process of potential hazard investigation. In view of the characteristics of large liquidity, wide specialty, dynamic field safety management and process management, the process dynamic control is carried out in the process of potential construction hazards investigation. PDCA circulation mode is a dynamic process management mode, and the process of building construction hidden danger investigation has the characteristics of dynamic and process management. Therefore, applying PDCA circulation mode to the process of building construction hidden danger investigation will greatly strengthen the all-round dynamic process safety management of hidden danger investigation, eliminate safety hidden danger, prevent accidents and reduce the risk of building construction process.

4.3 Implementation of Potential Hazards Investigation

The construction hidden danger investigation process should be a continuous improvement process of preliminary planning, implementation of investigation, potential danger rectification, potential danger elimination and analysis and promotion. Specific implementation can be divided into the following four parts:

(1) Pre-planning

In order to carry out the construction hidden danger investigation smoothly, it is necessary to carry out a series of preliminary planning work before the investigation process starts, mainly including determining the investigation target, investigation policy, determining the contents, time and personnel of the hidden danger investigation and formulating the hidden danger investigation plan.

(2) Execute investigation

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According to the hidden danger investigation scheme, according to the Safety Inspection Standard for Construction (JGJ59-2011), the safety inspection on safety management, civilized construction, scaffolding, foundation pit engineering, formwork support, work at elevation, construction power consumption, material hoist, construction hoist, tower crane and lifting, construction tools, etc. are carried out, and the hidden danger investigation on all aspects involved in the construction site is carried out in combination with the on-site construction stage. Conduct on-site potential hazard investigation and make statistical summary of the identified potential hazards to form a potential hazard investigation report (notification for potential hazard rectification). The potential hazard investigation report (notification for potential hazard rectification) should include: scope of potential hazard investigation, time, personnel, results of potential hazard investigation, description of potential hazards, potential photographs, etc.

(3) Rectification of hidden dangers

The person in charge of rectification shall complete the rectification of hidden dangers within the planned completion time according to the rectification plan. According to the hidden danger investigation report (rectification list), formulate the hidden danger rectification plan, define the rectification means, completion time, responsible person, etc., and assign the hidden danger rectification to one person, carry out the hidden danger rectification on the spot, and do well the hidden danger rectification, ledger and rectification supervision.

1) Potential danger rectification steps

According to the hidden danger investigation report (rectification list), the hidden danger investigation team holds feedback meeting, informs the members of the hidden danger investigation team and related personnel of the results of the detected hidden danger investigation, communicates with them, finally reaches the consensus of the hidden danger rectification, formulates the hidden danger rectification plan according to the hidden danger investigation report (rectification list), carries out the rectification activities and records the hidden danger rectification. The hidden danger rectification team will coordinate the related activities and assign specific rectification tasks and responsibilities.

2) Requirements for potential hazards rectification

In the stage of potential hazard rectification, it is required to allocate the potential hazard rectification work to the members of the potential hazard rectification team in accordance with the principle of "five definitions" (combined with grid management distribution on site). According to the principle of who is in charge and who is responsible, the rectification responsibilities and tasks of the members of the rectification team should be determined to ensure that the rectification of various potential hazards is carried out by a dedicated person, by a dedicated person, and the rectification time, standards and measures should be determined.

(4) Potential hazard resolution and analysis improvement

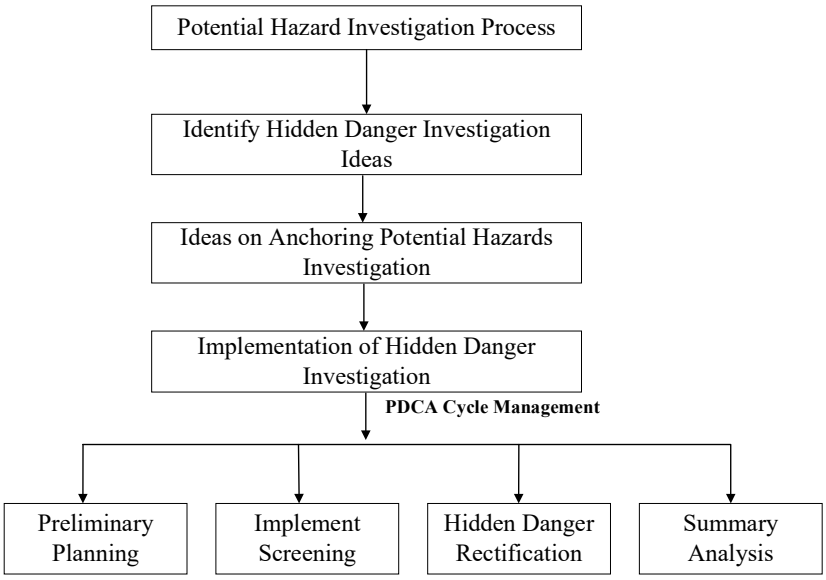

Figure 3: Potential Hazard Investigation Process

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The special hidden danger acceptor accepts and accepts the hidden danger rectification, and determines whether the result of the hidden danger rectification still has the possibility of causing an accident. According to the principle of "who investigates and who digests" of hidden dangers, the investigators digest the accepted hidden dangers and complete the closed-loop management of hidden dangers. Undigested or newly discovered hidden dangers are automatically transferred to the next PDCA hidden danger investigation cycle until the goal of "zero" hidden dangers on site is achieved. As shown in figure 3.

5. Treatment measures for potential hazards investigation

Combining with the process of hidden danger investigation, implement PDCA cycle management on site, and define the measures of hidden danger rectification.

5.1.1 Treatment of general hidden dangers

The hidden dangers detected by construction, supervision and construction units shall be rectified and eliminated immediately by the person designated by the construction unit as responsible. The hidden dangers found by investigation, design and third party units shall be rectified and eliminated.

The safety supervisors of the construction unit and supervision unit shall supervise and rectify the work by the side of the station and record the completion on paper.

5.1.2 Treatment of potential major accidents

(1) If safety can not be guaranteed before or during the removal of hidden dangers, evacuate workers from dangerous areas, evacuate others who may be endangered, set warning signs, strengthen monitoring and monitoring to prevent accidents.

(2) If a rectification notice is issued, the inspected unit shall implement the rectification as required and report it to the designated verifier for verification and reply to the unit for potential hazard investigation.

(3) If a delayed construction instruction is issued, the inspected unit shall apply to the inspecting unit for reinstallation after carrying out the rectification as required, and the construction can be resumed only after verification.

(4) Where a hidden danger treatment plan needs to be prepared, it shall be implemented after review by the technical staff of the unit under inspection, the main leaders of the unit under inspection and the technical leaders of the superior unit. The contents of the hidden danger treatment plan shall include: methods and measures adopted; Implementation of personnel and material resources; Time limits and requirements for governance; Safety measures and emergency plans.

6. Working mechanism for investigation and management of hidden dangers

(1) Statistical analysis of hidden danger treatment

1) Take monthly as the cycle, the construction unit, investigation unit, design unit, construction unit and supervision unit carry out statistical analysis on the data of potential hazard investigation and treatment, form analysis report and keep archives by themselves;

2) Statistical analysis is carried out on the investigation and treatment data of hidden dangers quarterly, semi-annual and annual to form an analysis report. The investigation unit, design unit, construction unit and supervision unit report the treatment situation to the construction unit. The construction unit shall keep archives.

(2) Application of hidden danger management achievements

1) The construction unit shall regularly analyze the treatment of hidden dangers in other units, formulate key links for hidden danger treatment and define the responsible units in accordance with the requirements of the superior leading units such as the state, local governments and competent departments;

2) The construction unit summarizes the best practices in the investigation and treatment of hidden

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dangers of other parties, formulates the list of best practices promotion for safety management every year, and promotes the application of achievements in hidden danger management.

7. Conclusion

This paper systematically clarifies the basic concepts of potential hazard investigation and management, and discusses the improvement of on-site safety supervision level of construction enterprises, so as to ensure the long-term and healthy development of enterprises. By defining the work responsibilities of investigation and treatment of hidden dangers of each main unit on construction site, the main responsibilities of construction unit, design unit, investigation unit, construction unit, supervision unit, third party inspection, monitoring and landing parties are sorted out, and their responsibilities for safety in production are firmly established. At the same time, it is clear that the PDCA cycle management mode is used in the process of hazard investigation and management, and the level of safety supervision and supervision can be improved continuously through preliminary planning, investigation, hazard rectification, hazard resolution and analysis. Determine the measures of hidden danger investigation and treatment of each party's main units, and construct the hidden danger investigation and treatment mechanism to protect the high-quality development of enterprises.

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