Research on Environmental Risk and Hidden Dangers in Civil Engineering Field

Haiyan Wang, Leilei LIU
China Academy of Transportation Science, Beijing 100029, China

Abstract: Based on the related results of accident causation research and the characteristics of engineering construction environment in civil engineering field, this paper puts forward the research method of integrated prevention and ore-control integration for engineering environmental risk in civil engineering field and hidden danger investigation, including the basic concepts and engineering connotations, and proposes the first process. The environmental risk list, then determine the monthly control plan according to the progress of the project, and finally implement the three-stage dynamic such as the daily hidden danger investigation according to the in civil engineering field and control requirements, and modify and update the environmental risk in civil engineering field and control list according to the situation of the hidden dangers on the spot.

1. Introduction
The concept and technology of risk in civil engineering field have greatly promoted the level of environment production in civil engineering field in China since the introduction of environment in civil engineering field in the field of engineering construction in China in the 1980s[1]. The Party Central Committee and the State Council have always attached great importance to work environment[2]. The "Decision of the CPC Central Committee on Several Major Issues Concerning Comprehensively Deepening Reforms" adopted by the Third Plenary Session of the 18th CPC Central Committee on November 12, 2013 clearly stated that "the establishment of an accident detection and in civil engineering field system for accidents and environment prevention and control system to curb serious and serious environment accidents." The construction of the "dual control" system has achieved remarkable results[3]. Moreover, on the one hand, the historical debts that effectively eliminate the effectiveness of the prevention and control of barriers (measures) include improving environment awareness and overall environment production accidents[4]. On the other hand, because Environmental environmental risk sources include hidden dangers, risk identification includes hidden dangers. If people artificially separate them, setting up two books and establishing two sets of systems will not only waste people's money and material resources, but also improperly distinguish the same kinds of things, which will affect their search, identification and in civil engineering field, which will not only be half-hearted and futile[5]. It is useless, and it may not be worth the loss due to improper handling. Adjusting and integrating the dual prevention mechanism in a timely manner, and supporting the dual prevention mechanism from the perspective of research and method as integrated prevention in civil engineering field will have important practical significance for effective prevention and control of accidents and reduction of in civil engineering field burden[6].
2. Overview of the cause of related accidents
In the Nontechnical System, the accident causal model is an important tool to ensure the environment operation of the system and avoid accidents. The research of accident cause has been studied by many scholars at home and abroad. Different theories have different practical scopes, or can explain the principle of accidents at the stage of social and historical development to the greatest extent.

2.1 Causal cause research represented by Heinrich
One of the earliest accident causal models was the Domino Model proposed by Heinrich in 1931, which described an accident as a series of discrete events that occurred in a particular chronological order. As a chain accident model, it becomes the basis of most accident models. The cause and effect research of Heinrich accident has a great influence on the theoretical research of later generations. On the one hand, it marks the stable establishment of the philosophical thought that "accident must have a cause", and rejects the supernatural attribution research of agnostic research of environment reasons.
First of all, the concept of human environmental behavior and the environmental state of the object is proposed, with the idea of a classification module. In Heinrich, a long time ago and a long time later, the research of environment cause is constantly developing on the basis of this. For example, the Bode accident causal chain research believes that the root cause of the accident is in civil engineering field mistakes. The Adams accident causal chain research will be The environmental behavior and the environmental state of the object are called field errors. These are some modifications to Heinrich’s research. They are effective in solving accidents caused by human error in physical component failure or relatively simple systems. Heinrich analyzes the chain accident model of accidents by deductive or inductive methods, and produces analytical tools such as failure mode and impact analysis (FMEA), fault tree analysis (FTA), and event tree analysis (ETA).

2.2 Modular research of risk factors marked by cheese model
With regard to the study of the risk factors of accidents, Heinrich first proposed the concept of human environmental behavior and the environmental state of objects, and has the idea of classification module, but did not conduct in-depth analysis on the complexity of social large systems. For active prevention, there is nothing to do. In the 1990s, Reason proposed the most famous "Swiss cheese" model of epidemiological models, and conducted an in-depth analysis of the social organization of the risk factors of accidents, and expressed the image of in civil engineering field defects at all levels as "holes". The different layers of the system are represented as slices of Swiss cheese. The occurrence of an accident is a coincidence of vulnerabilities at various levels in time and space. The “Swiss Cheese” model is representative of the modular model. The causes of accidents include human factors, physical factors and social in civil engineering field organization factors, which provide ideas for the active prevention of accidents, block the gaps, and prevent accidents. In 1995, on the basis of the research of capacity release, Professor Chen Bahia further proposed two types of hazard source theories of accidents. The first type of hazard is the energy subject of casualties and the premise of the second type of hazard. And determine the severity of the consequences of the accident; the second type of hazard is the necessary conditions for the first type of hazard to cause an accident, determine the possibility of the accident. Two types of hazard source research classify energy and propose specific accident prevention measures. The significance in reality is greater. The modular research is convenient for statistics, and it is easy to propose preventive measures. The disadvantage is that it limits the breadth and depth of the accident analysis. If there is no clear definition of the module, there will be many subjective components when used, which will lead to an increase in analysis error.

2.3 The theoretical model of social technology based on social complex systems is developing
The current more popular accident models are based on system research, which describes the accident process as a complex, interconnected network of events, not just a simple causal chain. Typical systemic accident causal models are: Rasmussen's Hierarchical Model of Socio-political System, Acclâim, Leveler (2004) STAM (Systems Theoretic Accident Model and processes) based on the
hierarchical model of social technology systems. Model, based on cognitive system engineering principles, CREAM, Cognitive Reliability and Error Analysis Method, 24Model and functional resonance analysis method.

3. Environmental environmental risk sources, hidden dangers and accident cause mechanism of engineering construction

3.1 Characteristics of environment construction of engineering construction

According to the statistics of historical accidents, bridge and tunnel engineering accidents have always occupied a considerable proportion in the total number of traffic accidents, exceeding 80% for three consecutive years. Most of the accident types are collapse, high altitude fall, lifting damage, object blow, mechanical damage. Vehicle damage, etc. There are a large number of first-class Environmental environmental risk sources at the construction site. In addition to a large number of major hazard sources such as pressure vessels and heavy oil tanks, the investment in each unit and sub-projects is huge. The accident not only caused casualties, but also caused a large amount of property damage. The collapse accident occurred in a large proportion, and the accident was more serious.

After analysis, the collapse accidents are concentrated in the operation of lifting machinery and scaffolding. The fall of the high places is mainly concentrated on the construction of high slopes of the roads, as well as the environment of the edge, the entrance and the water. Although these technical solutions are mature methods, due to the comprehensive factors of various aspects, the hidden dangers of on-site investigations continue to be realized, and these links are also high-incident points of accidents, which are in line with the environment technical axioms of “real risks of increased hidden dangers”.

Because the construction of the project is mainly engaged in field operations, although the level of construction mechanization is constantly improving, there are still a large number of labor-intensive operations, such as the construction of large-scale bridges on the water foundation, the cross-border operation of the high slope of the road, etc. The reform of enterprise restructuring and employment system, the construction workers team has undergone fundamental changes, a large number of temporary workers, migrant workers, large mobility, insufficient understanding of the high risk of construction projects, objectively causing increased pressure on the environment in civil engineering field of the construction site, the established Security protection measures can be obtained, can not be done, that is, the second type of risk source has become an important part of engineering environment hazards.

3.2 Basic Conceptual Agreements and Engineering Implications

Risk Concept and Risk Factors: It is the object of risk in civil engineering field and refers to the direct factors that may lead to the occurrence of risk events, including the first type of risk source and the second type of risk source. The first type of risk source has inherent risks and is an evaluation unit for risk assessment. The second type of risk source is the time-sensitive measure for the first type of risk source, that is, the hidden danger.

The first type of risk source: the source of energy that produces energy in the production site or the carrier of the ability to own energy (environment principle). The risk of the first type of risk source is closely related to the level of energy and the amount of energy. In engineering environment in civil engineering field, the severity of a risk event. The first type of environmental risk sources has inherent risks that determine the severity of the consequences of the accident.

The second type of risk source: the various environmental factors that lead to restraint, restrictive measures (shield) out of control, failure or damage. Including people's environmental behavior and the environmental state of things. The second type of risk source has realistic risks, and the difficulty of the second type of risk source determines the probability of accident occurrence. In terms of system security, the second type of Environmental environmental risk sources include people, things, and the environment.
Although in civil engineering field defects are not a direct factor of accidents, hidden danger in civil engineering field is not only accountability, but more importantly, fundamentally building the system and improving system security. In order to better guide the investigation and in civil engineering field of hidden dangers, it has practical guidance, and the contents of in civil engineering field aspects of human environmental behavior, such as the three violations of in civil engineering field personnel, the implementation of in civil engineering field system is not effective, and the insecurity of things. The aspects of the environment regarding the environment, such as the workplace, surrounding structures, etc., are separately proposed as in civil engineering field and environment. In the "Interim Measures for the Hazard Prevention of environment Production in the Highway and Waterway Industry", the contents of hidden danger in civil engineering field are defined: "human environment behavior, environmental conditions of the object, environmental factors of the place, and in civil engineering field defects."

Evaluation unit: The object of risk assessment, which can be a single project, or a collection of projects in the entire region, or a unit project, a division project, a sub-project, a unit operation, or a combination of several specific projects.

Unit construction procedure refers to a certain professional feature, which is completed by the corresponding type of work during construction and has clear construction activities, such as footwork work, drilling work, blasting work, and lifting work.

4. Introduction to integration research and methods

The three-stage dynamic PDCA integrated in civil engineering field method for preventive ore-control and hidden danger investigation (hereinafter referred to as the integration method) is a scientific, systematic, reasonable and effective environment in civil engineering field technology and method system. The specific calculation matrix is the following form.

\[
H = m \cdot \left[ n \cdot m \cdot (A + B + P + Q) + U \right] \\
Q = p \cdot \left[ n \cdot m \cdot (A + B + P + M) + H \right] \\
U = g \cdot \left[ n \cdot m \cdot (A + B + P + H) + I \right] \\
W = o \cdot \left[ n \cdot m \cdot (A + B + P + Q) + E \right] \\
I = h \cdot \left[ n \cdot m \cdot (A + B + P + U) + O \right] \\
E = i \cdot \left[ n \cdot m \cdot (A + B + P + W) + R \right] \\
O = j \cdot \left[ n \cdot m \cdot (A + B + P + I) + P \right] \\
R = u \cdot \left[ n \cdot m \cdot (A + B + P + E) + T \right] \\
P = k \cdot \left[ n \cdot m \cdot (A + B + P + O) + M \right] \\
T = y \cdot \left[ n \cdot m \cdot (A + B + P + R) + Y \right] \\
M = l \cdot \left[ n \cdot m \cdot (A + B + P + P') + Y \right] \\
Y = t \cdot \left[ n \cdot m \cdot (A + B + P + T) + M \right]
\]

The integration method should not only analyze the empirical mode method for the environmental behavior of engineering construction scale, construction plan, construction conditions, etc., but also prejudge the potential risk events, and also investigate the environmental behavior of people on the spot. The environmental state, in civil engineering field and environmental defects of the object, based on the environment axioms of the hidden dangers to increase the actual risk, comprehensively determine the environmental risk in civil engineering field measures according to the investigation of the hidden dangers on the spot, and realize the “evaluation according to the evaluation and the evaluation according to the investigation”.

Risk in civil engineering field includes identification and control of the first type of hazard (such as energy or hazardous substances), as well as identification and control of the second type of hazard (hazard). Therefore, through risk in civil engineering field, comprehensive prevention of risks can be achieved. Control, so as to effectively solve the "unexpected" problems caused by the limited scope of identification, but also solve the problem of thinking and "can not live", to build a solid double barrier for the production of production environment accidents.

The integration method is a model of modern security risk in civil engineering field. It emphasizes preventive supervision beforehand. It is a proactive and active in civil engineering field model. It emphasizes the potential benefits of environmental risk to real risks when conducting risk identification. At the time of investigation, deep mining in civil engineering field systems, culture and other deep in civil engineering field defects and systemic reasons.
The integration method is a dynamic in civil engineering field method. It uses the PDCA cycle in civil engineering field to not only realize the release, rectification, and acceptance of the PDCA small loop of hidden danger investigation and in civil engineering field, but also use the hidden danger investigation to modify the mid-cycle of risk in civil engineering field and control in real time. According to the construction progress, From the overall plan, to the monthly plan, to the daily hidden dangers of the implementation of the control measures, the overall cycle of the whole process is realized.

The integration method firstly formulates the overall risk list of the whole process, and then determines the monthly in civil engineering field and control plan according to the progress of the project. Finally, according to the in civil engineering field and control requirements, it implements the daily hidden danger investigation work, and according to the on-site hidden danger investigation situation, the risk in civil engineering field and control list is modified and updated in real time. In this process, according to the importance of the risk event and in civil engineering field requirements, the parties involved in the construction are responsible.

The analysis method, also known as the seven-question analysis method, was the first in the US Army Weapons Repair Department in World War II. Simple, convenient, easy to understand, use, and inspiring, widely used in corporate in civil engineering field and technical activities, it is also very helpful for decision-making and executive activities, and it can help to make up for the omission of consideration.

China's work environment supervision and in civil engineering field has always emphasized two main responsibilities. One is that enterprises are the first responsible for environment production, and the other is that the government is the main body of environment production. Specifically, the government fulfills its supervisory responsibility through supervision and spot checks, and the construction unit and the supervision unit pass the supervision and inspection to perform the environment in civil engineering field responsibility, and the construction unit implements the responsibility for production environment. The environment in civil engineering field departments of the participating units at all levels fulfill their responsibilities for organization, inspection and supervision.

From a quantitative point of view, risk events can be identified by a certain method, which is a small, general, large, and important four-level risk level. It is important to grasp the key points and difficulties of environment in civil engineering field. However, from the entire project. In the whole process, the focus of the industry leaders and the participating parties is different, so it is necessary to establish the importance of comprehensive and systematic risk events. Combine the inherent risks and risk levels to establish seven types of risk events.

Different types of matters, according to the in civil engineering field requirements, the work content is also different. For example, for the unit project in civil engineering field included in the overall assessment, the overall risk assessment report will be completed on time, the overall assessment technology will be submitted, and the overall project emergency plan will be prepared. According to the basic procedures of the construction project, after participating in the bidding, the project participants will first carry out construction preparation, standardization construction, and then carry out verification of the environment conditions for the commencement of construction. After the completion of the project, the director will sign the commencement order, marking the formal entry of the project into the construction period. All units, branches or sub-projects shall be carried out in an orderly manner according to the construction organization plan. In a specific project, these types (not necessarily all) have attributes of spatial location.

5. Conclusion
Utilizing the concept of modern security risk in civil engineering field, the integrated in civil engineering field of the dual system construction of preventive ore-control and hidden danger investigation of engineering construction projects is realized, and the PDCA theoretical system and 5W2H model of the whole process of highway waterway engineering construction are established. It is
true that engineering construction, as an important activity of our social and economic construction, is subject to the pressure of economic benefits in the fiercely competitive environment, which leads to the systematic migration of organizational behavior to the boundary of accidents. On the basis of modular theoretical research, system goal control and in civil engineering field are realized. Is the focus and difficulty of future research.

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