

# Hidden Dangers and Countermeasures of Laboratory Safety Management in Colleges and Universities in China

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**Abstract**—Laboratory safety management in colleges and universities is an important guarantee for normal teaching and research activities. In this paper, the connotation and characteristics of laboratory safety management in colleges and universities are detailed, followed by the analysis of the hidden dangers and problems of laboratory safety management in China, and feasible strategies and suggestions with pertinence, timeliness and operability are explored to better serve the long-term development of university education.

**Keywords**—colleges and universities, laboratory safety, laboratory management, hidden dangers, countermeasures

## I. INTRODUCTION

In recent years, accidents caused by laboratory casualties and property losses have occurred from time to time, which also sounds an alarm bell for us, so that we have to pay high attention to laboratory safety. Laboratory safety is an important part of laboratory construction and management in colleges and universities, which is related to the smooth development of experimental teaching and scientific research in colleges and universities. Whether school property can be protected from loss and whether the safety of teachers and students can be guaranteed is of vital importance to the stability of universities and even the society.

## II. CONNOTATION AND CHARACTERISTICS OF LABORATORY SAFETY MANAGEMENT

The word safety refers to the absence of danger and accidents. Laboratory safety means that there are no safety hazards, no direct safety threats and no safety accidents before and after the experiment. Laboratory safety management is an activity with decision-making, planning, organization and control to achieve the goal of laboratory safety. Laboratory safety management mainly applies the

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principles, methods and means of modern safety management to analyze and study various unsafe factors in the laboratory, and take effective measures from the organizational, ideological and technical aspects to solve and eliminate various unsafe factors in the laboratory and prevent the occurrence of various laboratory safety accidents.

Laboratories of different disciplines and majors have their own contents and requirements of safety management, but generally speaking, laboratory safety management has the characteristics of diversity, complexity, comprehensiveness and service [1].

### A. Diversity

With the rapid development of higher education in China, the investment in laboratory construction in colleges and universities has increased greatly, and the laboratory construction has reached an unprecedented level both in quantity and quality. Because of the difference of each laboratory, there are various requirements of safety management. It is the precondition of maintaining laboratory safety to formulate specific and feasible safety technology and safety management methods based on different laboratories.

### B. Complexity

There is an increasingly high requirement of opening and sharing laboratory resources. There are more and more people entering the laboratory, and the problem of laboratory safety is becoming more and more complex. Laboratory safety management involves two aspects of “hardware” and “software”. It is not only the management of instruments and equipment, safety technology and environment, but also the management of people. Instruments, environment, safety technology, human and other aspects are hidden in many minor security risks. Teachers and students' safety awareness, behavior, and operation process norms will have an impact on laboratory safety. Therefore, laboratory safety management involves all aspects of laboratory work.

### C. Comprehensiveness

Laboratory safety management is like an engineering

system. Laboratory safety management covers a wide range of areas, which is difficult to manage. It is so comprehensive that it can not only involves the internal management system of the laboratory, but also includes the external management system of the laboratory, which requires the participation of various departments, be responsible at all levels, coordinate and cooperate with each other, and full implementation of the safety responsibility system of the laboratory, forming a good atmosphere of co-management.

#### *D. Service*

Management is the method and means of service and service is the purpose and fundamental of management. Laboratory safety management is not only a simple management, but also reflects its service. With the change of management styles, that is, from experience-based management to science-based management, and from simple management to service-oriented management, focusing on people-oriented concept and striving for safe and high-quality service, has become one of the important characteristics of laboratory safety management. Only by strengthening the sense of service, adhering to the purpose of service and providing high-quality service can we truly ensure the safety of laboratory.

### III. HIDDEN DANGERS AND PROBLEMS OF LABORATORY SAFETY MANAGEMENT IN CHINA

#### *A. The construction of management system*

The management system is not perfect and the responsibilities and powers are not clear. Some colleges and universities have not yet established a safety management network from the school leaders to the grass-roots laboratories. Lack of clear responsibility implementation for all aspects of laboratory safety management has resulted in the confusion of multidimensional cross-management, unclear responsibilities and powers, poor coordination and untimely emergency disposal [2].

#### *B. Safety awareness of teachers and students*

Under the guidance of the traditional concept of “teaching and scientific research first”, there are many problems, such as weak safety consciousness, low attention to laboratory safety, insufficient awareness of the importance of laboratory safety work, and lack of systematic thinking on all aspects of safety management [3]. The publicity, education and training of laboratory safety have been too one-fold. Due to the lack of innovation and simplicity, the operation norms of laboratory safety cannot be truly implemented, and the relevant laboratory technicians lack the necessary safety awareness and emergency handling ability.

#### *C. The management of dangerous chemicals*

Dangerous chemicals management is an important part of laboratory safety management in colleges and universities. In order to further standardize the purchase,

use, daily monitoring and scrap of dangerous chemicals, China has strengthened the relevant management in recent years. However, there are still some problems in the safety management of laboratories in colleges and universities [4]. For example, the storage, use and management of dangerous chemicals are not standardized, and there is a lack of centralized storage of special warehouses.

#### *D. Safety facilities configuration and security system*

With the enlargement of the scale of running a school, many experimental sites in colleges and universities are becoming increasingly tense, and personnel are more intensive and mobile, which directly affects laboratory safety in fire control, emission, safe evacuation and protection. Some experimental buildings with a long history of electricity security issues are very prominent, and pipeline leakage, circuit aging, line chaos, overload and other issues are very common [5].

#### *E. Emergency capacity management*

Emergency management system is not perfect in many schools [6]. Although formal or temporary emergency management organizations have been set up in most colleges and universities, their responsibilities and division of labor have not been clearly defined, and most of them do not pay attention to the particularity of laboratory emergency management. Besides, lack of emergency professionalism may also lead to the failure of laboratory safety management. In fact, although many teachers and students work in the laboratory for a long time, they have little understanding of the safety and protection of the laboratory. Because of the complexity of the type of experiment, once an accident occurs, they are often at a loss and lacking in ability of professional response and disposal.

### IV. COUNTERMEASURES OF LABORATORY SAFETY MANAGEMENT IN CHINA

#### *A. Improve laboratory safety management system construction and ensure operation*

In order to establish an efficient and feasible laboratory safety management system, it is vital to have the responsibilities clearly divided. Presidents of colleges and universities are the first responsible persons for school safety work. The school leaders in charge of the teaching laboratory work in colleges and universities are the important leaders responsible for the safety work in the teaching laboratory. Other school leaders are responsible for supervising, inspecting, guiding and managing the safety work of teaching laboratories within the scope of their administration. The party and government leaders in the secondary units of the school are the main leaders responsible for the safety work in their teaching laboratories. The school teaching laboratory safety management organization and full-time management personnel are responsible for the daily safety management of the school teaching laboratory. The person in charge of

the school teaching laboratory is the direct responsible person for the safety work of the laboratory.

Ensuring the smooth operation of safety management mechanism is an important basis for realizing the safety of teaching laboratories. Colleges and universities should scientifically analyze the safety risk factors and behaviors of teaching laboratories, posts and personnel of different majors, promote scientific, standardized and efficient management, realize the whole process, all elements and all-round management and control of teaching laboratory safety, and construct the safe operation mechanism of teaching laboratories throughout their life cycle. The safety management mechanism should be optimized to ensure that the safety management links are tight, the division of labor is fine, and the links are close, so as to effectively prevent the occurrence of safety accidents.

#### *B. Strengthen safety education and raise safety awareness*

Obviously, lack of safety skills education is the main cause of major accidents and casualties. In recent years, laboratory safety accidents have occurred frequently, causing great property losses and many casualties in colleges and universities. Analyzing the causes of safety accidents in colleges and universities, we can easily find that there are problems in hardware construction and software construction in laboratory safety accidents: insufficient system, weak sense of safety, lack of safety technology, inadequate measures to deal with emergencies and so on. After a detailed analysis of the occurrence process of each major safety accident that caused serious property losses and casualties, we will find with grief that at the beginning of each accident, if the correct treatment methods, rescue measures and personnel escape methods can be adopted, the loss caused by the accident can be reduced to a very small extent. Therefore, in laboratory safety management, safety skills education and training should be placed in a more prominent position.

Guided by the spirit of important instructions and in accordance with the requirement that all the staff should be involved in the whole process of laboratory safety management, we should carry out the education of relevant laws, regulations and standards of teaching laboratory safety for teachers and students, and improve the pertinence and effectiveness of teaching by means of case-based teaching, normative training and regular inspection and assessment.

Before entering the laboratory, teachers and students should make full use of the learning platform of safety knowledge in school laboratories, earnestly study all kinds of safety knowledge in laboratories, and understand the main hazards that may be encountered, the requirements and methods of accident prevention and elimination. In view of the actual situation of the laboratory, the relevant courses of safety propaganda and education are added in the experimental teaching, and the relevant professional manuals and other materials are printed and distributed, so as to enhance the safety awareness of teachers and students and improve emergency skills such as prevention, risk

avoidance, self-help and self-care. Each laboratory should organize teachers and students to conduct emergency evacuation drills regularly every year to familiarize themselves with the escape routes in emergencies.

#### *C. Strengthen the construction of a regulatory system for hazardous chemicals and ensure its operation*

Colleges and universities should manage and control the safety risks of dangerous sources, especially those related to procurement, transportation, storage, use and waste disposal, in a full time and all-round way, and form the files and corresponding databases of the safety risk distribution of dangerous sources. According to the results of safety inspection, the classification and disposal plan of hazards should be formulated. The hidden dangers detected should be classified according to different levels, so that the situation is clear. Through the closed-loop management of listing, rectification and marketing number, the hidden dangers can be eliminated one by one.

Hazardous chemicals management must be “four without one guarantee”, that is, no theft, no accident, no loss, no violations, and security. For poisonous chemicals in dangerous chemicals, the management system of “five pairs”: double custody, double collection, double use, double locks and double principal accounts, should be implemented in accordance with the management requirements for highly toxic chemicals. The safety management of hazardous chemicals in laboratories should be included in the performance appraisal to ensure that the safety responsibility layers of laboratories are in place.

For relocated or abandoned laboratories, the flammable and explosive dangerous goods existing in abandoned laboratories should be thoroughly checked and dealt with in a timely manner in strict accordance with the relevant requirements of the country, so as to eliminate various potential safety hazards. After confirming that there is no dangerous substance in the laboratory, all localities, departments and schools choose qualified construction units to demolish the abandoned laboratory according to the relevant laboratory abandoning procedures.

#### *D. Strengthen the allocation of safety facilities and the construction of a security system*

To make sure the necessary safety facilities and equipment are complete and effective, it is a feasible way to equip a strong teaching laboratory safety team, and ensure the investment of teaching laboratory safety funds. Besides, building a unified information system of teaching laboratory safety management, and implementing the annual report system of school teaching laboratory safety work also work. For the long-term stability of laboratory management, colleges and universities should vigorously strengthen the standardization construction of laboratory safety. The old laboratories can be renovated and renewed. The new laboratories should be constructed according to the national safety regulations for laboratory environment and facilities.

*E. Strengthen the capacity of safety emergency response.*

In order to improve the ability of dealing with emergencies, colleges and universities must have a complete emergency plan and a rapid response problem handling team.

The formulation of emergency plan should invite experienced public safety experts to participate in the whole process, and explain in detail the organization, personnel composition, disposal measures, methods and steps. It must be required that every semester, it should take time for emergency plan drills to ensure that all participants are familiar with the whole process and master scientific and effective response methods. Once an emergency occurs, the development trend of the accident can be controlled in the shortest time and at the lowest cost so as to minimize losses.

Colleges and universities should accurately grasp the characteristics and dangers of safe experiment in the process of building emergency system for safety production emergencies. Universities should also rationally set up emergency organizations for production safety. At the same time, colleges and universities should conform to the urgent response and reporting process. Moreover, each department should effectively link up with the safety emergency plan system of the university. Colleges and universities should actively organize emergency drills and constantly improve emergency preparedness after the preliminary establishment of emergency preparedness system for safe experiment. The system, through emergency drills, improves the level of emergency ability, and tests if it is scientific, rational and

feasible, after which, it will find out the shortcomings of the emergency plan and continues to improve.

#### REFERENCES

- [1] Xu Jingqi and Xu Shuyan, *Laboratory Safety Management in Universities and Colleges*. Xiamen: Press of Xiamen University, 2016.
- [2] Xu Xiaofeng and Wen Xinghuo, "Analysis and Discussion of Laboratory Safety Management in Universities and Colleges" in *Research and Exploration of Laboratory*, 2012, Vol. 31 (08), pp. 81-84+87.
- [3] Cui Guoyin, Huang Gang, Guo Sheng, Nie Xiaopeng and Yin Chanjuan, "Construction and Practice of Laboratory Safety Management System in Colleges and Universities from the Perspective of Economic Globalization" in *Market in China*, 2018, Vol. 34, pp. 112-113+115.
- [4] Wang Feng, "Discussion on Dangerous Goods Management in Laboratories of Colleges and Universities" in *Modern Educational Equipment in China*, 2014, Vol. 21, pp. 36-37+46.
- [5] Huang Kun and Li Yanchao, "Current Situation Analysis and Countermeasure of Laboratory Safety Management in Colleges and Universities in China" in *Research and Exploration of Laboratory*, 2015, Vol. 34 (01), pp. 280-28.
- [6] Sheng Lu, Wang Jingyu and Sun Pinyang, "Discussion on Laboratory Emergency Management" in *Experimental Technology and Management*, 2015, Vol. 32 (01), pp. 233-236.
- [7] Ministry of Education in China. Notice of the General Office of the Ministry of Education on Further Strengthening the Safety Inspection of Teaching Laboratories in Colleges and Universities [EB/OL], Jan. 2019, [http://www.moe.gov.cn/srcsite/A08/s7945/s7946/201901/t20190124\\_368001.html](http://www.moe.gov.cn/srcsite/A08/s7945/s7946/201901/t20190124_368001.html).