

Analysis of Quality Supervision and Safety Management Measures in Construction Engineering

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Abstract: Quality supervision and safety management in construction engineering are critical to ensuring the smooth implementation of projects, guaranteeing engineering quality, and safeguarding personnel safety. This paper provides an in-depth analysis of the importance of quality supervision and safety management in construction engineering, identifies existing problems in these areas, and proposes targeted measures to strengthen quality supervision—including improving the supervision system, enhancing the competence of supervision personnel, and strengthening whole-process supervision—as well as measures to enhance safety management. The implementation of these measures aims to improve the quality standards and safety management efficiency of construction projects, thereby promoting the healthy and sustainable development of the construction industry.

1. Introduction

Because construction engineering is a necessary part of the national economy in direct relation to people's lives and property safety, social stability. The construction industry develops very fast, the scale of construction project is growing all the time, the technology becomes more and more complicated; thus the requirements for quality supervision and safety management are becoming higher. However, there are still many problems existing in the field of quality supervision and safety management, resulting in frequent occurrence of quality and safety incidents and causing greater losses to society. So it is of great practical significance to strengthen quality supervision and safety management in construction engineering, and explore the effective management methods.

2. Importance of Quality Supervision and Safety Management in Construction Engineering

2.1 Ensuring Engineering Quality: Building a Solid Foundation for Long-Term Projects

At the heart of construction projects lies engineering quality that translates to the functionality of a building and the ability for people to live their lives without putting either themselves or their property in jeopardy^[1]. The supervision of construction engineering is the strict control in all aspects from project planning and design to construction and completion verification. At the construction phase, supervision staff also conduct stringent checks of building materials, components and equipment according to relevant standards and specifications that avoid substandard products from entering the construction site. Indicators like steel strength and cement grade are tested for adherence with design parameters. Safety: Construction techniques and operational processes are supervised in real time, which prevents the emergence of unsafe practices that can induce quality hazards. The quality of the building is affected by things such as how compact concrete vibration and mortar joints in brickwork are. Issues can be detected and rectified early enough, avoiding subpar projects which would have resulted in the delivery of poor-quality construction through proper supervision.

2.2 Ensuring Personnel Safety: Upholding the Principle of Life First

Construction is a high-risk industry with dangers that include but are not limited to: falls from heights, being struck by an object, electric shock and collapse^[2]. In construction engineering, management of safety is important. It is the establishment of a comprehensive safety management

system and operational procedures to standardize rules for each position, clarify safety responsibility, and stipulate the behavior of construction personnel so as to reduce accidents. Construction staff must correctly wear and use personal protective equipment including safety helmets, safety belts, and safety nets. The primary role of safety education and training is in improving the technical competence or skills and safe working practices so as to enhance safety awareness for emergency response amongst worker. Similar to safety lectures and emergency drills, you can orient workers on how to respond in an emergency, the safety procedures involved and how they can self-rescue. Daily inspection and specialized inspections for construction sites are regularly performed by safety management personnel, who promptly discover hazards and eliminate them immediately, and strictly implement the measures addressing violation in orders to create a safe and tidy condition for construction.

2.3 Promoting the Healthy Development of the Construction Industry and Social Progress

Quality supervision and safety management are important to the healthy development of the construction industry. Projects of good quality and safe construction areas will probably improve the standing and picture of building companies, which will strengthen their intensity in delivering a competitive market^[3]. In a competitive market, quality and safety-centric enterprises are more likely to win some brand recognition and trust from clients through securing more project bids. Failure to address these will put them at a disadvantage in the competitive market. Hey, these standardized quality supervision and safety management have played a significant role in providing technological innovation and management improvements for the construction industry. Enterprises consistently upgrade technologies, procedures, and materials to adhere to quality and safety standards along the way which enhances efficiency and quality of construction. A regularized business encourages more proficient laborers to enter the development area, bringing new energy into the practical improvement of this sector and advancing monetary and social improvement.

3. Issues in Quality Supervision and Safety Management in Construction Engineering

3.1 Quality Supervision Issues

3.1.1 Incomplete Supervision System

Construction engineering quality supervision system is not perfect, there are still some loopholes and deficiencies. In some regions, the arrangement of supervision institutions is unreasonable; there is a shortage of supervision resources, and it is difficult to meet the needs for large-scale projects. In addition, the non-standardized supervision procedures and standards have resulted in local protectionism and ineffective supervision which ultimately challenge the fairness and efficiency of quality supervision ^[4].

3.1.2 Uneven Competence of Supervision Personnel

Quality oversight personnel require professional experience and significant expertise in the subject area. But there is great diversity in the competence of the supervisory personnel. Some are poorly trained as professional engineers and they have insufficient exposure to new technologies, processes, and materials which makes it difficult for them to accurately evaluate engineering quality problems. Some lack sense of responsibility and often do their jobs superficially and thus affect the quality of work ^[5].

3.1.3 Outdated Supervision Methods

Quality requirements for construction projects are increasing with the advancement of construction technology. Visual inspection or simple measurements are not sufficient for traditional supervision methods anymore. Some supervision institutions still use these backward ways, lack of the ability to detect a lot of deep quality defects caused by high and cost technology means. The low level of informatization also makes the supervision information transmission and processing timely and low accuracy, which reduces the overall efficiency of supervision work.

3.2 Safety Management Issues

3.2.1 Poor Implementation of Safety Management Systems

Although national and local governments have proposed a series of safety management regulations for construction engineering, the implementation is often not in place. Safety management systems of some construction enterprises have flaws, and safety responsibilities are not entirely feasible. Safety inspections rarely result in immediate and complete solutions to problems they identify. In certain construction projects, there are not enough safety management personnel to make safety management work ^[6].

3.2.2 Lack of Safety Awareness Among Construction Personnel

Construction workers have a low level of education and lack awareness of safety, required knowledge related to safety, and skills for self-protection. However, safety service violations like not wearing protective gear and taking unnecessary risks are rampant. Several construction enterprises mainly focus on profit-oriented rather than safety education and training, leading workers to lose their opportunity to raise their awareness of safety practices and working skills.

3.2.3 Insufficient Safety Investment

Investment in Safety: Ensuring Safety in Construction Engineering On the other hand, in order to reduce costs, many construction units have reduced safety investments and used simple and crude safety protective facilities; at the same time, safety warning signs and personal protection equipment are missing or insufficient; for example, there is also a shortage of investment in research and application technology. Such high-level hazards make it difficult to integrate advanced safety technologies and management methods/systems for improving on-site safety levels.

4. Measures to Enhance Quality Supervision and Safety Management in Construction Engineering

4.1 Measures to Strengthen Quality Supervision

4.1.1 Improve the Supervision System

A proper layout should be made for the establishment of quality supervision institutions, according to project scale and regional distribution. Third, strengthen the standardization of supervision institutions, clarify responsibilities and authorities. Establishing and perfecting the supervision system, we need to create both scientific and normative supervision work ^[7]. Banning local protectionism and ineffective supervision will require nationally unified supervision procedures and standards. Training in supervision procedures and standards should be given to make sure all facilitation base properly. Mechanisms for assessing the performance of supervision institutions and personnel should be improved to enable regular review of their work in order to facilitate active fulfilment of responsibilities.

4.1.2 Enhance the Competence of Supervision Personnel

Training organisation required for supervision personnel to keep them updated about new Technologies, processes and materials. The training content should include construction engineering quality standards, specifications and testing technologies, focusing on practical operational skills. Professional ethics education should be further developed to embody responsibility and mission. Conducting integrity education and warning education, guiding supervision personnel to establish correct values and power view, prevent illegal behaviors such as interpersonal favoritism and fraud.

4.1.3 Strengthen Whole-Process Supervision

The construction drawings should be reviewed to ensure that the designs meet the applicable codes and specifications before any actual construction started. We should be strictly assess and review the qualifications of construction units, personnel credentials, and designs of construction

organization to ensure that each link has in-behave a means manage ability. Supervise the quality of building materials, components and equipment so poor products enter the construction site details. Dynamic quality control should be strengthened through regular inspections and timely corrections of issues during construction^[8]. This is an area of concern call out: Key processes which involve hidden work shall be under close inspection to ensure compliance with design inputs. We must enhance construction process records and file management to establish a foundation for quality retrospective. To ensure the project is completed, all inspections must be performed to standards and specifications during project completion and check and accept, to ensure gratuity and functionality. The issues found during the check and accept shall be cleared on priority and projects being handed over to the client only once rectification is qualified.

4.1.4 Innovate Supervision Methods

Detecting devices and technology is more likely to be achieved if new methods, such as non-destructive testing and infrared thermography, can make quality inspections more accurate and reliable. These technologies can discover entrenched quality hidden dangers, serving as sound technical assurance for quality supervision. Recommendation: Digital means shall be used to build a quality supervision information management system, so as to transmit and share supervision information in real time and improve relevant efficiency. Take advantage of big data analysis to dig deep into supervision data, and provide scientific basis for quality supervision decision-making.

4.2 Measures to Strengthen Safety Management

4.2.1 Improve the Safety Management System

Establishing a comprehensive safety responsibility system, clarifying the safety of all parties involved in construction units, supervision units and other responsibilities. Get work safety responsibility statement signed to entrust security duties among various departments and people. The duty of care should be implemented with close monitoring and accountability measures for units and individuals who fail to fulfill their responsibilities. According to the characteristics and actual situation of construction projects, complete safety management system and operation procedure basis should be established, such as safety production education training system and other related establishment procedure such as: safety inspection system, all kinds of safety accident emergency plan et al. These systems and procedures must be invoked by all construction units with respect to safety rules.

4.2.2 Strengthen Safety Education and Training

Management, technical and construction personnel entering the construction site should receive safety education and training. Trainings should include safety laws and regulations, some types of safety service regulations, and the incidents in which they happened to help build up their safety awareness and self-protection ability. We should organize emergency drills from time to time to improve the ability of construction personnel to cope with emergencies. Drills should include common safety incidents like fires, collapses and electric shocks. Revise and improve safety accident emergency plans to carry out rapid and effective rescue operations in the event of accidents.

4.2.3 Increase Safety Investment

The construction enterprises shall increase investment and provide necessary safety protection facilities such as safety warning signs, protective railings, safety nets and other protective equipment. Construction site, temporary facilities are to be periodically inspected and maintained for safety and security purposes. We should also promote the active application of advanced safety technologies and management methods, such as intelligent safety monitoring and warning systems. These technologies enhance the safety management level on construction sites by detecting and removing safety hazards in a timely manner.

5. Conclusion

In summary, the healthy development of the building industry depends on quality supervision and safety management. Quality Problems in Construction Can be Conducted Timely Correction of the Quality Supervision System through Sound Quality, Through a sound quality supervision system can identify the process of construction problems, and in a timely manner to correct them, so that all construction products meet design requirements and safety standards. Strict safety management measures provide a safe and reliable working environment for construction personnel, which effectively reduces the rate of accidents and protects lives. At the same time, strengthening communication and cooperation among all parties will form a strong co spiraling force to provide more high quality, safe construction projects for society's vigorous demand for high-quality buildings and better living environment to promote sustained, stable and high-quality development of construction industry.

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