

Construction Engineering Quality and Safety Management and Quality Inspection of Engineering Materials

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Abstract: The development of construction engineering industry has close relationship with the stability of China's socio-economic structure. In contemporary construction engineering, project quality and seepage prevention are extremely important, and material quality control is an indispensable part of ensuring the safety during construction. In line with this, this paper presents specifically describes project quality and safety management strategies based on regulations, personnel, and supervision techniques in construction. At the same time, it elaborates on the unique connotation of engineering material quality inspection, highlighting that material quality is an integral part of project quality and benefits. It additionally analyzes the technical essentials of engineering material quality inspection, hoping to raise construction engineering reliability and all-round benefit.

1. Introduction

Usually, construction projects bestow large scales and long durations with different construction phases as well as technical points, which demand high requirements for human resources, materials of construction and management & supervision schemes. Material quality control should become a major entry point to ensure comprehensive quality and safety of construction projects. Construction companies should increase their resource allocation in aspects such as material procurement, supervision, and on-site application management. In materials quality is the key to success of construction, targeting inspection of materials is essential in the process. As a result, in order to obtain the expected benefits in quality and safety management, targeted management plans need to be designed surrounding different scales, functional characteristics of projects and applicable policy requirements enabling proper regulation during construction ensuring social value and economic value generation from the project ^[1].

2. Analysis of Key Points in Construction Engineering Quality and Safety Management

2.1 Building an Informatized Data Platform for Efficient Supervision of the Entire Construction Process

In the information-age of rapid development of information technology, a properly built data platform for specific projects can ensure that quality and safety management is effective. Through informatization, it enriches the functions and characteristics of the platform, so that project managers can more effectively and accurately understand the construction progress, key quality and safety management points, cost control status and personnel work status. In particular, a construction engineering informatized data platform should integrate functions such as: Real-time Data Acquisition (collected through various parameters of multiple stages via sensors and the internet); Storage Management (adopting big data technology to store data that is crucial for safety, integrity, stability and security processes so it will not be lost easily); Data Analysis & Mining (big data filtering mechanisms are utilized to enhance operational efficiency by improving the information identification accuracy during project scheduling at up-to-date status); Data Visualization (abstract raw datas expressed in an considerate manner through graphics, images or

tables& diagrams clearly understand situational awareness of construction site),Data Sharing(data-sharing between different participants/departments/projects etc., when performing docker data effectively gathers all architecture from the various contractors who are working on bits of the work and hence unifying information interfaces&formats giving a widely better bits of knowledge into building management exercises, When embraced within the stages, thusly, it can promptly be successful to numerous key focuses concerning quality control additionally dangers markers at all spans of structure. The result would be to generating personalized approaches for the management of quality and safety ^[2].

2.2 Improving Regulations and Systems, Perfecting the Supervision Framework

Construction industry in China is so fast, but have a low price housing and very high cost at the same time. Index English This forces construction companies to continuously improve the plans of quality and safety management over projects providing quality in order to protect benefits ^[3]. Still, not even the new age for overhauling quality and security can trade a reasonable project supervision structure established on sound. Currently, the outdated nature of existing laws and regulations sometimes reveals shortcomings since the modernization pace of industries exceeds their adaptation. Thus, amending and improving relevant laws and regulations is a priority in building an umbrella supervision system of domestic construction projects so as to guarantee both quality and safety. Specific measures include:

Firstly, Refining Responsibilities. Many past legal frameworks merely mentioned roles and responsibilities, but without precise allocation of decision-making responsibility between agencies/offices/individuals. Instead, future regulations should clearly define the roles of actors in the entire process, allocating responsibilities for various construction stages and specifics to different departments/personnel and codifying them into appropriate laws/regulations. Secondly, Increasing Penalties. Details Earlier, the penalties for non-disclosure and negligence committed by accountable public agencies and persons were not effective enough to make a non-complying entity pay higher 'costs'. Further revisions should enhance the regulatory deterrent effect, increase penalty levels for violations or noncompliance (fines, revocation of qualifications, stoppage of work and rectification) to reinforce the importance that construction units attach to quality and safety management ^[4]. Final: Inclusion of Provisions on New Technology Use.

Various new technologies are increasingly being used in modern construction projects. The older regulations have only cursory information about classification, usage precautions or what constitutes these technologies at a particular level of standards. Therefore, to make using new technology more measurable and so construction, the clauses for adopting new techniques should bring in Revisions with respect of field of input and how these instruments will be used ^[5].

3. Exploration of Key Points in Construction Material Quality Inspection

3.1 Importance of Construction Material Quality Inspection

3.1.1 Ensuring Material Quality

A crucial phase in the construction activities is choosing out of various engineering materials. Part of Material Quality Improvement in material quality, performance or specifications is directly reflected in project quality, safety and payoff. In this regard, a rigorous material quality control audit is important ^[6]. By establishing rigorous inspection approaches, the quality and performance of materials can be evaluated from sourcing, process to delivery as specifications are defined at every stage. It reduces the probability of poor materials coming to site. This is to say that detailed inspection strategies ensure the quality of this material.

3.1.2 Further Optimizing Construction Structure and On-site Construction

Material inspection techniques are various but often consist of non-destructive testing (NDT) that does not change the original structure or performance of the material. Some of the common NDT techniques are ultrasonic testing, infrared thermography and X-ray inspection. The flexible

applications of these technologies may skillfully analyze material density and strength, corrosion, deformation etc. giving different parameters. These parameters can be used by project managers to ascertain the quality and performance of matter (material) and whether it fulfills the requirements needed on-site ^[7]. Parameters can also be further examined with the help of an array from which they can optimize the construction structures and on-site processes to ensure full building quality and advantages.

3.2 Analysis of Technical Key Points in Construction Material Quality Inspection

3.2.1 Key Points of Non-Destructive Testing (NDT) Techniques

NDT, as described before, is the most popular method of quality assurance that utilizes physical principles (e.g., sound, light, electricity and magnetism) to detect material defects (X-ray; thermography; ultrasonic testing). Ultrasonic testing has been regarded as a standard and reliable method to detect any internal voids or cracks, and also can be performed by measuring the density for an evaluation of their internal deformation. Defect characteristics obtained from thermography are based on surface temperature differences; thus, the principle is straightforward, and the operation on-site is quite convenient ^[8]. X-ray testing provides major benefits by finding internal defects with very low cost, high accuracy through X-ray scanning.

3.2.2 Key Points of Sensor Detection Technology

Sensor technology, which is also a widely used type of inspection for buildings in China as NDT, is prevalent than NDT in this regard. Sensor technology can be effectively used in material inspection to ascertain parameters like temperature, humidity, pressure or density. It enables on-time observation of the moving parameters. This monitored data is feedback to a central processor using internet technology, which in turn reacts according to the distinct data. Such data forms a solid foundation for construction managers and designers with respect to adapting the on-site construction procedures, understanding precautionary measures and carrying out proficient quality and safety management.

Currently, with advancing technology, research in sensor detection is deepening, optimizing previous methods. The application scope of sensor technology in material inspection is bound to expand further.

3.2.3 Computer Simulation Testing Technology

Computer Simulation is another essential quality inspection technology. Through simulation based on the stress conditions of materials, it can detect possible quality defects effectively. In the case of defects, design engineers and managers can reselect materials or optimise them if they don't meet on-site requirements. Besides, it also provides a more scientific factor and rational design scheme for the projects, enabling quality and safety management to take many factors into account effectively reducing risks. The computer simulation technology has a good development prospect and also needs to be continually iterated according to the industry development level, project scale and function in the future, which will help improve inspection efficiency and accuracy of modern construction projects.

4. Conclusion

To sum up, a sound quality and safety management plan should be incorporating enough contents starting from the design phase, including aspects like on-site construction, quality control and testing, safety management system, cost control system, process coordination as well as human resource management strategies for achieving project quality and safety during constructions. For construction units and contractors, quality and safety management is an ongoing exercise; the management plan should be continuously improved to different project specifications so as to provide comprehensive benefits during implementation. Material Quantity is a crucial component of construction management. In order to achieve its effectiveness, flexible selection schemes and technologies for inspection should be chosen with exact understanding of technical key points.

At present, the common quality detection technologies of material mainly cover non-destructive testing, sensor detection and computer simulation test. The flexible use of these technologies makes the inspection to material take into account various aspects which allow the quality and security management. This expands the scope for encouraging modern construction that allows designers and contractors to better manage and optimize their processes with a good level of quality and safety assurance capability, thus more effectively managing the likelihood of risks. That, in turn, will increase the space for modernization and sustainable development of China's construction industry.

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