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Research on Green Construction Management in Smart Site Platform

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Abstract

Green construction management in our country after many years of development has made great progress, but at the same time, it has also exposed many problems and shortcomings. With the development and application of smart site technology, the new information technology represented by smart site will open a new situation for green construction management. At present, the development of smart site technology in the industry has begun to take shape, but the main application direction is still in the safety management. In this paper, the problems of green construction management are studied. Based on the analysis of the needs of green construction management in the smart site platform, a green construction management scheme based on smart site is proposed to improve the management level of green construction.

Keywords

Green construction, Smart site, Digitalization

1. Introduction

The mainstay industry of our national economy has made important contribution to sustained and healthy development of our country economy. However, the construction industry production methods are still relatively extensive: the construction site management chaos, low production efficiency, low mechanization of production, profit margins continue to go down and other problems in the construction industry generally exist, which has a great gap with the development of our high quality requirements. On the other hand, construction activities, as the concrete embodiment of human transformation of nature, inevitably have an impact on the underground and above-ground space. People pay more and more attention to the huge waste of resources and environmental pollution caused by construction production activities. Therefore, the concept of green construction is put forward.

In order to solve the problem of insufficient power for the development of green construction, the industry began to use research and development and application of green construction technology, in order to promote the improvement of green construction level. The report of the 19th National Congress of the Communicate Party of China put forward the strategic goal of accelerating the reform of ecological civilization system and building a beautiful China, and raised China's green development to a strategic position of national and social development, which triggered the vigorous development of green construction in China, and the research and application of green construction technology is becoming more and more in-depth. Especially the green construction management based on information technology has been paid attention to in the industry. In the "10 New Technologies in the Construction Industry" (2017 edition) released by the Ministry of Housing and Urban-Rural Development, the green construction technology includes "green construction online monitoring and quantitative evaluation technology". By installing intelligent monitoring devices on the construction site and using communication equipment and computer software, this technology realizes green construction management. Shan Caijie et al. put forward an online monitoring framework and a quantitative evaluation framework for green construction, which opens a new direction for green construction informatization.

With the development of information technology, the intelligent construction site construction with the integrated application of BIM technology, 5G communication, Internet of things, big data, cloud computing, intelligent equipment and other advanced technologies is spreading rapidly. Its highly informationized management helps to improve the efficiency of site management and decision-making ability, and also provides new opportunities for the innovation of green construction management.

2. Related Concepts

2.1 Green Construction

The difference between green construction and traditional construction mainly lies in the different target elements: green construction is in the traditional construction requirements of quality, schedule, safety and cost, but also takes "environment and resource protection" as one of the main control objectives to control. The increase of control objectives in the construction process is bound to bring construction cost increase to the construction enterprise, and the green construction in environmental and resource protection requirements is much more strict than the traditional construction requirements, the direct economic cost pressure to the construction will be higher, which seems to be contrary to the "four sections and one environmental protection" advocated by green construction. The reason for the formation of this view is that we ignore the "four sections" in green construction and the traditional construction of "saving" meaning is not the same. Traditional construction only focuses on the enterprise's own economic costs, and pursues economic maximization under the premise of completion quality, schedule and safety. Green construction should consider the premise of the completion of the established construction objectives, to achieve the overall social environment friendly, resource

conservation, which is the difference between the local benefit concept and the overall benefit concept.

To sum up, green construction is from the overall interests of the society, focusing on the construction industry to implement control methods. The conservation emphasized by green construction is the conservation of the natural and social environment. The purpose is to minimize the impact of construction activities on the natural and social environment and realize efficient utilization of resources.

2.2 Key Points of Green Construction Management

Green construction consists of three aspects: organization and management, resource conservation and environmental protection. Resource conservation includes material conservation, water conservation, energy conservation and land resource conservation. Environmental protection mainly includes construction site dust control, noise control, light pollution control, water pollution control, garbage disposal and the use and storage of dangerous goods and chemicals. The above contents cover the main indicators of green construction, and along with the progress of the project construction throughout the construction planning, material procurement, site construction and other stages.

The implementation of green construction should be considered as a whole, and the overall requirements of green construction should be fully considered in the project planning and design stage, so as to lay a good foundation for the subsequent implementation of green construction. In the planning stage of green construction, we should give full consideration to various factors of project construction, do a good job in the selection of construction machinery, material selection and green construction technology adoption, and improve the green construction scheme of the project. In the field implementation stage, we should strengthen the disclosure and publicity of the green construction scheme, strengthen the supervision and management of the whole construction process, and ensure that the measures of the green construction scheme are effectively implemented in the project. In each stage of green construction, attention should be paid to the collection of green construction data, and according to local conditions, from the actual situation, clear the project green construction evaluation elements, timely stage evaluation summary, to achieving dynamic correction in the process of green construction.

2.3 Smart Construction Site

With the development of the information technology supported by the smart site, the function of the smart site is constantly improving and the application scope is also constantly expanding. From the initial information management, safety management and business management, the smart site gradually expands to personnel management, schedule management, construction planning, quality management and so on. The concept of the smart site should also be constantly adjusted with the development of technology. At present, the industry is transitioning from digital items to intelligent development. Combined with the technological development and the characteristics of smart site, this paper defines the smart site as the following:

Smart construction site is based on building information model (BIM), cloud computing, deep learning of big data, Internet of things perception, deep neural network, mobile Internet and other information technologies. Centering on the key factors of the construction site, such as human, machine, material, method and environment, the smart construction site aims to improve the management efficiency and decision-making ability of various businesses such as project quality, safety, schedule, technology and business. It is a highly informationized management and control platform with comprehensive perception, information connectivity, technical intelligence, decision-making science, pre-control risk and other capabilities.

2.4 Smart Site Platform Framework

Smart site system is a platform that integrates various hardware such as sensors and monitors with modular management systems in order to realize the concept of smart site. The initial purpose is to improve the efficiency of site management, change the passive supervision of construction into active monitoring, and there may be auxiliary decision-making and autonomous decision-making functions in the future. According to the types of projects applicable to the smart site and the units using it, the structure level of the smart site platform varies, but according to its basic functions, it can be roughly divided into the following four levels:

The hardware layer contains all the hardware facilities that constitute the smart site system, such as RFID, sensors and monitors for sensing functions, computers for data input and output, and transmission networks and storage devices for information exchange.

Software layer, including smart site system to achieve construction management business of various management, such as safety management system, quality management system, labor management system, material management system and so on.

The data layer refers to all kinds of information generated when the construction site business occurs. The function of the data layer is to collect, organize, store and transform the information to provide data resource support for decision-making.

The analysis and decision level is the core of the smart site. According to the needs of different business management, it carries out data analysis through intelligent algorithm, mining the internal relationship between the data, realizing intelligent prediction, monitoring and alarming, so as to provide reliable solutions for the site target management.

3. Overall Framework of Green Construction

Considering the basic requirements of quality assurance and safety defined by green construction, combined with the basic guarantee items in the evaluation criteria, green construction objectives include green construction planning, safety management, quality management, human resource management, construction nuisance management, etc.

Figure 1 shows the contents of green construction:

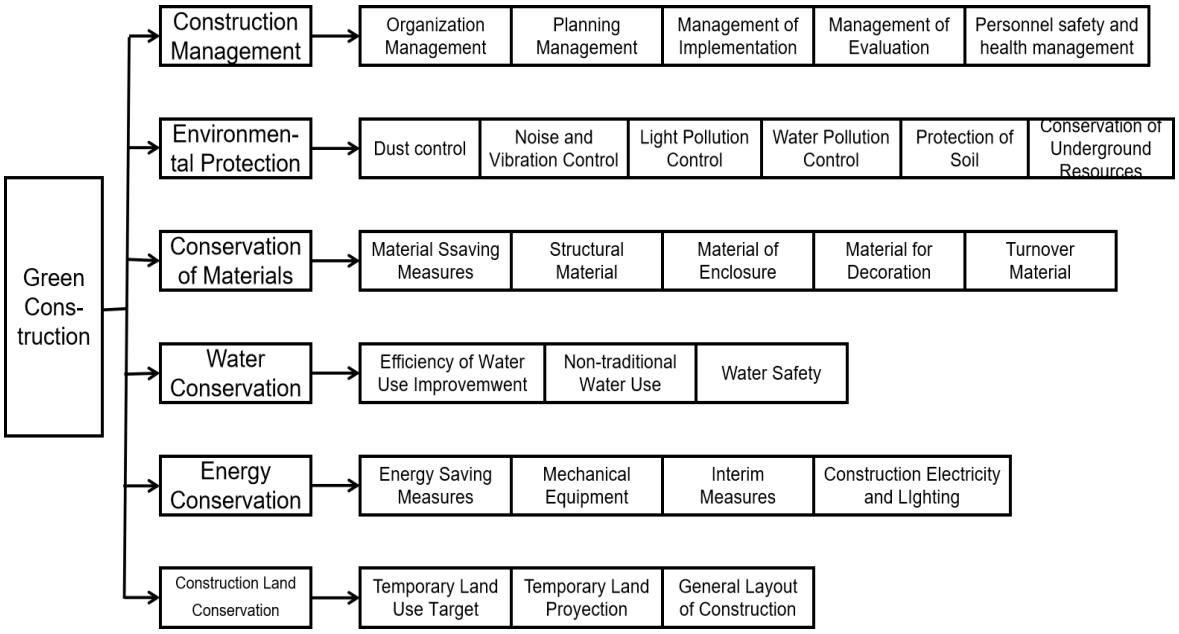

Figure 1. Overall Framework of Green Construction

4. Requirements of Green Construction Management in Smart Construction Sites

Combined with the current application and implementation status of smart site and existing problems, according to the management objectives and requirements of green construction and management business needs, the requirements of green construction management in smart site construction are analyzed.

(1) Green construction planning needs

The premise of the implementation of green construction management is to do a good job of green construction planning, and the main content of green construction planning is to identify the key indicators of green construction and formulate corresponding technical measures on the basis of being familiar with the construction site, the construction situation and the surrounding environment. Therefore, by integrating various work contents of green construction planning into the smart site platform, with its powerful information management ability, the efficiency and accuracy of green construction planning can be improved, which is conducive to the implementation and application of green construction planning on the site.

(2) Green construction business process management requirements

The implementation of green construction requires the establishment of a green construction leading group, which generally takes the project manager of the construction unit as the leader and the relevant post management personnel as the team members to implement various measures of green construction. Therefore, the smart site platform needs to combine various business processes of green construction management, establish corresponding management accounts, and fulfill post responsibilities. Meanwhile, the platform process should meet the actual business needs to ensure smooth flow of the process in the system and standardized online business operations, so as to improve the efficiency of

green construction management.

(3) Green construction cost management needs

The implementation of green construction will undoubtedly generate incremental costs for the construction enterprises. The layout and modification of smart electricity meters, water meters, video monitors, sensors and other equipment need to invest additional measures. If enterprises can accurately predict the incremental cost of green construction in the planning stage of green construction, focus on controlling these costs in the construction stage, and combine the benefits of green construction with a comprehensive analysis, we can have a more quantitative and intuitive understanding of the overall benefits of green construction, and contribute to the promotion and implementation of green construction.

(4) Green construction fine management needs

In the process of green construction, various monitoring data need to be collected, including material loss, material recycling and utilization, carbon emissions, power consumption per 10,000 yuan of output value, water consumption and other indicators. According to the different construction stage and construction content, the daily and weekly monitoring workload is very different, and these work require a lot of energy of management personnel to statistical analysis. Errors and omissions will inevitably occur, which will affect the accuracy of data. At the same time, these monitoring data are generally stored in paper data or localized data, which is not easy to review and transfer information. The information integration of the smart site platform can help achieve the accuracy, timeliness and traceability of green construction monitoring data collection. In addition, it can provide more adequate data support in the evaluation of green construction, so that the evaluation can be more objective and accurate.

(5) Green construction comprehensive digital management needs

At present, the successful application of smart construction site in green construction management only focuses on dust monitoring and noise monitoring. The business coverage is too low, and the data monitoring is not comprehensive enough. Monitoring and management should be carried out from all aspects of four sections and one environmental protection, such as the construction site fire water, construction water consumption, foundation pit precipitation and rainwater recycling amount. At the same time, the advantage of 24-hour online smart site is utilized to realize the uninterrupted monitoring of the green construction status of the site, to achieve all-round and whole-time monitoring, and to achieve comprehensive digital management.

5. Conclusion

By constructing an explanatory structural model and analyzing the factors influencing the implementation of green construction management scheme based on smart site, it is suggested to promote the implementation of this scheme from the following three aspects.

(1) Project implementation level

The project is the direct subject of the implementation of the green construction management scheme based on the smart site. Improving the quality level of management personnel, strengthening the concept of green construction and popularizing the application value of the smart site are the most direct measures to promote the implementation of the new management scheme. Specific methods include: at the project level, organize all staff for technical disclosure of the new management scheme, regularly carry out green construction education, carry out smart construction site in the form of video or broadcast, publicize the value of green construction and so on. In the implementation, it is necessary to strengthen the coordination among various departments, clarify the job responsibilities and contents of each professional post, divide the business scope well, implement the responsibility assessment, and avoid the influence of a certain department or a certain person on the overall operation of the program, which is the key to avoid the inadequate collaborative management. In addition, the project should pay attention to the collection and mining of knowledge data related to green construction, not only to ensure sufficient knowledge support for the implementation of the project, but also to ensure that after the implementation of the experience database, to provide reference for subsequent projects.

(2) Enterprise level

The high cost of implementing smart construction sites and green construction is the current situation faced by enterprises, but this should not be the reason for enterprises to reject the new scheme. At present, the construction industry is developing in the direction of information, intelligent and green. If the traditional construction concept of low efficiency and high consumption is held, it will be eliminated by the industry. Construction enterprises should adjust their strategic planning, actively allocate the R&D investment of smart site information technology and green construction technology, rely on key projects, focus on infrastructure investment, business process exploration and management system establishment, and improve the applicability and effectiveness of the new green construction scheme in the continuous implementation and improvement. At the same time, enterprises should also pay attention to training comprehensive technical talents who know information technology and green construction, so as to realize the advantages and effects of the new green construction management scheme, and finally form a new situation of green construction management in which all employees participate and everyone creates effects.

(3) Industry level

Competent government departments and relevant industry associations need to increase the publicity of smart site and green construction, continuously introduce relevant incentive policies and normative systems, and guide the industry to invest more resources to study and develop smart site and green construction technology. Only when the technical level is improved, can the foundation of green construction management scheme based on smart site be firmly laid. The subsequent management system, business process, construction costs and other issues will be slowly solved one by one.

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