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MULTIFACTOR IMPACT ON HOUSING CONSTRUCTION IN THE RAINY SEASON: AN IMPROVEMENT STUDY

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Abstract: *Architectural projects, from inception to completion, entail a complex and time-intensive process. The pursuit of construction efficiency often leads some entities to overlook the significant impact of weather conditions, resulting in a prevalent issue known as rainy season construction. However, during the rainy season, adverse weather conditions such as wind and rain contribute to an elevated occurrence of engineering quality issues and safety accidents. Hence, it is imperative to proactively undertake relevant construction preparations to safeguard the quality and safety of engineering projects.*

Keywords: Rainy season construction, Construction efficiency, Engineering quality, Safety precautions, Weather impact on construction.

1. Introduction

In the field of architecture, a project from design to construction can not be completed in a short period of time, but a long-term and complex working mode. However, in order to catch up with the progress, some units unilaterally pursue construction efficiency without considering the influence of weather, so rainy season construction has become a common problem in engineering construction. However, in the rainy season, due to the influence of wind and rain, the incidence of engineering quality problems and safety accidents increases, so it is necessary to make relevant construction preparations in advance to ensure the safety and quality of engineering construction.

2. Preface

2.1 The Research Status at Home and Abroad:

Previous research on seasonal construction and rainy season construction are relatively comprehensive. In 2018, when Li Hu studied the safety management of civil seasonal construction, he came to the conclusion that different measures should be taken in different seasons [1]. Song Xiaopeng, who holds the same view, also thinks that effective management measures should be taken according

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to different seasonal characteristics to ensure the safety of seasonal construction of civil engineering [2]. Xu Li,Li Yongmei and Zuo Yanan once pointed out that special attention should be paid to construction measures during the seasonal construction of construction projects [3]. Similarly, Hou Xueyong [4] also said that the influence of temperature change caused by seasonal changes on construction can not be ignored. In 2022, Yang Jie pointed out that the application of rainy season construction technology can improve the construction speed, shorten the construction period and avoid construction safety accidents, which is an important guarantee for building engineering construction [5].

The research on the sub-projects in rainy season construction is also as follows, Yao Junxia. The decoration of buildings is affected by weather and climate [6]. In 2021, Zheng Guolei, Guo Xiangyuan and Song Jiangbin [7] also expounded that concrete cracking is related to seasonal construction in "Research on Concrete Cracking Prevention Technology in Seasonal Construction of High-rise Residential Buildings" and put forward corresponding measures. There is also another strange way to study the application of elastic waterproofing membrane in rainy season construction method [8]. In 2022, Zheng Rongzu [9] analyzed the rainy season construction scheme from two aspects of preparation and technical measures, and obtained corresponding measures. In addition, foreign El Sawalhi, Nabil, Mahdi and Mahdi also obtained the results that extreme weather events, rainfall changes and temperature changes have the greatest impact on the life cycle of construction projects through the questionnaire survey of local construction practitioners [10]. In addition, Li Haixia studied the influence of seasonal factors on project cost decision-making, providing reference for studying seasonal construction measures [11].

2.2 Research purpose and significance

The rainy season construction has its own unique characteristics, and it is difficult, which is a severe test for construction safety. There are many unfavorable factors in rainy season construction, which will not only affect the normal construction progress and quality of the project, but also reduce the safety of building construction and pose a threat to life. Therefore, in order to ensure the quality and construction safety of the project, the rainy season construction scheme should be formulated in advance, and the rainy season construction scheme should also be improved with the times, so as to better ensure the construction progress and quality and improve the construction safety. See figure 1.

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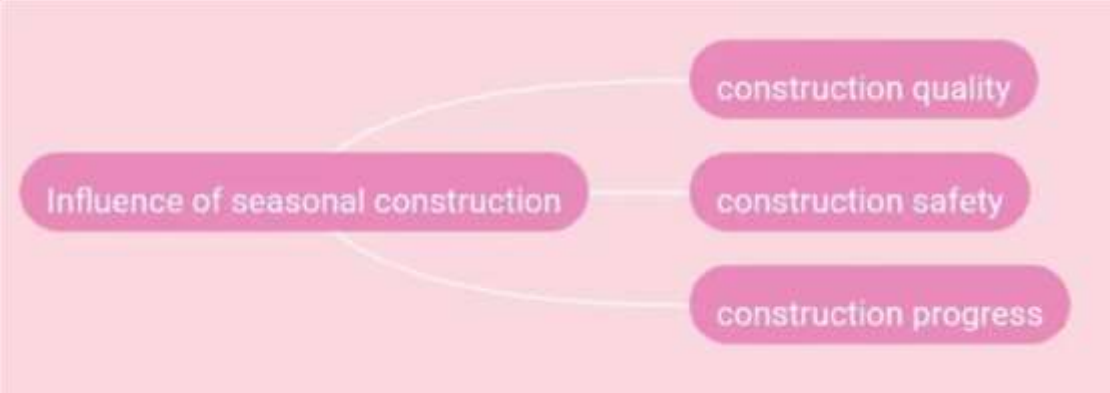

Figure 1 Schematic diagram of seasonal impact

3. Theoretical basis

3.1 Seasonal construction

Seasonal construction refers to the corresponding construction according to the characteristics of seasons in engineering construction. Considering the unfavorable factors of natural environment, measures should be taken to avoid or weaken its adverse effects, so as to ensure that the engineering quality, engineering progress, engineering cost, construction safety and other items meet the design or specification requirements.

3.2 Rainy season construction

The project is built in rainy season, so it is necessary to take rainproof measures.

3.3 Construction scheme in rainy season

The rainy season construction scheme refers to the defense scheme, countermeasures and measures formulated in advance according to the project construction situation in order to ensure the construction quality and safety of concrete, roads and tunnels in the rainy season, so as to ensure the safety of the project, reduce losses and ensure the construction progress and quality in the rainy season.

3.4 Basic principles of rainy season construction

During the construction in rainy season, comprehensive consideration should be given to the sudden situation, and the building structure and construction foundation should be reasonably controlled to avoid serious damage in the construction and take protective measures. As shown in figure 2.

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Figure 2 Schematic diagram of basic theory

4. Hidden trouble

The seasonal construction scheme involves a wide range of aspects and various contents, so it is impossible to be detailed one by one. Therefore, this paper studies three aspects of the rainy season construction scheme in the seasonal construction scheme. As shown in Figure 3.

Figure 3 Mind map

4.1 Earthwork in rainy season

In the original plan, it is emphasized that the slope excavation is reasonable and the earthwork is placed according to the regulations, but there are still hazards under the rainy season construction conditions: the excavated slope collapses and landslides, and the heavy rainfall in the rainy season causes floods, which can seriously cause equipment subsidence, damage or casualties.

4.2 Hoisting operation in rainy season

In the original plan, the measures for this kind of project are to equip qualified hoisting personnel, educate hoisting personnel to standardize the construction according to the regulations, and improve the safety awareness of construction personnel. This statement is too shallow, and more detailed measures should be taken to avoid harm. The hidden dangers in the hoisting project in rainy season are: the hook is separated from the rope, the rope is broken, the hoisting is unstable, and the movement is unstable, which may cause casualties, damage to goods and resources, property losses and other hidden dangers are endless and unimaginable.

4.3 Equipment electricity consumption in rainy season

In the original plan, only standardized electricity consumption was emphasized in the rainy season. There is no doubt that this statement has not minimized the harm caused by the rainy season climate, and there is a huge potential safety hazard. Once an accident happens, the consequences are

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unimaginable, and short circuit may occur during the rainy season construction. In the rainy season, the equipment is damp, and the wires and cables are prone to leakage and electric shock. Casualties caused by electric shock and equipment damage may cause irreparable consequences such as fire. Figure 4 below shows the "mess" caused by the lack of detailed and exact rainy season construction plan.

Figure 4 A "mess" pattern of construction

5. Improvement measures

5.1 Earthwork in rainy season

The research idea is shown in Figure 5, and the specific measures are as follows.

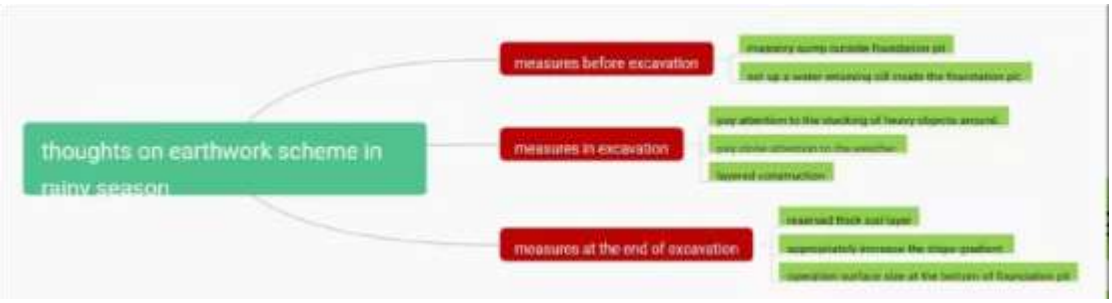

Figure 5 Idea diagram of earthwork measures

(1) The base operation shall be set with a water slope of 2% in the direction of the sump, and it is forbidden to pile up materials and sundries on the operation surface to affect the smooth drainage. When it rains, it is equipped with water pumps to drain the sump (two of which are used as backup) and drain the water into the drainage ditch on the ground.

(2) The accumulated water in the foundation pit is discharged into the sump, and then pumped into the ground drainage ditch by the water pump, as shown in Figure6.

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Figure 6 Collection sump pattern diagram

(3) Around the foundation pit and trench to be excavated, water retaining barriers or earth dikes should be made to prevent surface water from flowing into the pit and trench.

(4) During excavation of foundation pit earthwork in rainy season, in order to ensure the stability of the foundation pit slope, earthwork or other heavy objects shall not be piled up within 1m from the foundation pit or within the scope specified in the design, and pay attention to observe the stability of the slope at any time.

5.2 Hoisting operation in rainy season

The research idea is shown in Figure 7, and the specific measures are as follows.

Figure 7 Train of thought for hoisting operation in rainy season

(1) Check the working environment: the tower crane should be checked in time after rainy days, observe the foundation settlement, and make observation records. If there is any settlement, it should be treated immediately to ensure the safety of the tower crane when it is used. Four settlement observation points are set on the tower foundation, and settlement observation is carried out regularly and after rain, and problems are handled in time when found.

(2) Pay attention to lightning protection: before the operation, the wheeled crane should stabilize its legs, and the mobile crane should check the circuit first; The minimum distance between the boom wire rope, lifting heavy objects and overhead transmission lines shall not be less than 1.5m, and the vertical safe distance shall not be less than 2.5m..

(3) Pay attention to the sliding of objects: after the lifting objects get wet by rain, the surface will be smooth, especially for all kinds of pipe string bodies. When lifting, the noose must be wound and locked, and the method of "pocket" must never be used.

(4) Operators working high above the ground should pay attention to anti-skid and wear rubber-soled shoes. Hard-soled shoes are not allowed to operate high above the ground.

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(5) Beware of extreme weather: In case of severe weather such as fog, heavy rain, gale above level 6, the hoisting operation must be stopped immediately.

5.3 Equipment electricity consumption in rainy season

According to the idea as shown in Figure 8, the following concrete measures are obtained.

(1) Large mechanical and electrical equipment placed in the open air should be waterproof and moisture proof, and its mechanical bolts and bearings should be oiled and rotated frequently to prevent corrosion. All mechanical and electrical equipment should be equipped with leakage protectors.

(2) Mechanical and electrical equipment (butt welder, chainsaw, planer, etc.) that is relatively fixed at the construction site shall be covered with a canopy or a protective cover for the motor; Plastic sheeting is not allowed).

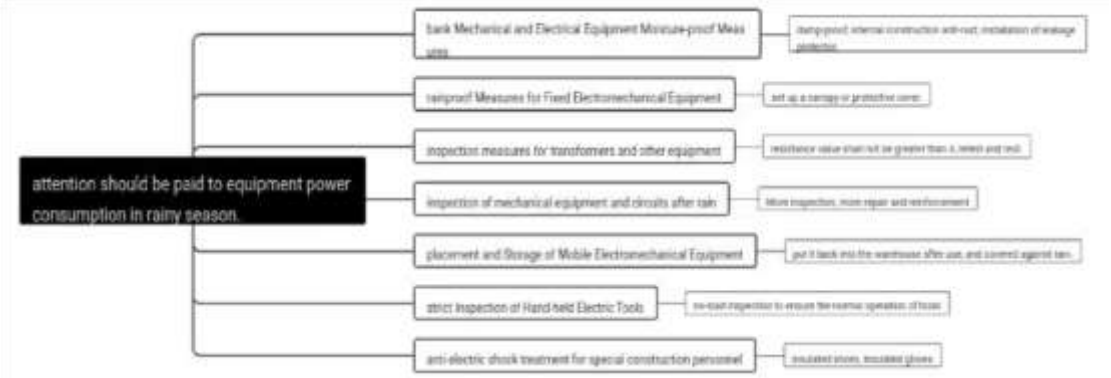

Figure 8 Thinking diagram of equipment power consumption measures in rainy season

(3) The grounding resistance values of transformers and lightning arresters must be retested (the resistance value is greater than 4 ohms), and those that do not meet the requirements must be handled in time. A preventive test should be done for lightning arrester.

(4) The installation of mechanical and electrical equipment and the erection of electrical lines must be carried out in strict accordance with the temporary electricity utilization plan and measures.

6. Case analysis

6.1 Earthwork in rainy season (case 1)

According to the description of the construction workers, there is no theoretical error in normal operation of unreasonable excavation and irregular excavation in this case, but a safety accident still occurs, causing serious consequences. The situation is shown in Figure 9.

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Figure 9 Collapse phenomenon

The following is what we think is the correct scheme. During the rainy season construction, water retaining cofferdams are set up around the pit top (inside the safety protective railings) with bagged soil, and the excavated earthwork is transported away in time, and shall not be piled on both sides of the pit top. In addition, it is not advisable to insist on the construction in the case of heavy rain, and the construction should be resumed until the rain decreases until the minimum impact on the construction is ensured.

6.2 Hoisting operation in rainy season (case 2)

In this case, the construction workers have a weak sense of safety and insist on hoisting operations in heavy rain and strong winds. This is also the imperfection of the construction plan in rainy season, which is a big loophole in the construction measures. It is not responsible for the project, but also for life.

During the rainy season, the hoisting operation should be based on the principle of "safety first". Unlicensed operation and disorderly command are strictly prohibited. Before lifting operation, first check whether the equipment meets the safety requirements and whether the wire rope is broken.

6.3 Equipment electricity consumption in rainy season (case 3)

This case is an accident of equipment power consumption in rainy season. Before the improvement, the rainy season construction plan did not have too many constraints on electricity consumption in rainy season, which would lead to the negligence of workers in electricity consumption in rainy season and lead to accidents.

The research of this paper emphasizes that the electric shock accident can be basically avoided in a certain sense by making normative guidance and constraints on the equipment power consumption in rainy season, and electricians must hold relevant certificates. If the workers in this case can check cables and wires regularly and pay attention to tools and equipment, the accident can be avoided.

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7. Conclusion and prospect

7.1 Summary

When the building construction goes through the rainy season, it must be controlled in strict accordance with the relevant construction specifications, and the construction progress plan should be implemented in strict accordance with the rainy season construction plan, putting the project quality and workers' safety first, and improving the construction safety while ensuring the normal construction schedule. Combined with the detailed construction schemes of three partial projects proposed in this paper, they are applied to the construction organization to provide convenience and guarantee for their own projects.

7.2 Prospect

Construction projects in rainy season must be prepared for a rainy day and always be prepared for safety protection. The problems that need to be covered in the rainy season construction are too complicated, and we need to continue to study and study in the future. I will discuss and study the storage of building materials and equipment maintenance, floods, landslides and mudslides, and strive to make the rainy season construction plan more perfect and contribute to the construction industry of the motherland!

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