



High-support Mould Construction and Risk Assessment in Civil Engineering Works

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Abstract: With the rapid development of the construction industry, advanced construction technology and new building materials continue to emerge. High-supporting mould technology, with the advantages of large bearing capacity, convenient erection and strong applicability, has been widely used in the field of construction engineering. However, due to the high height, large span, many rods, complex and variable force and other characteristics of the highly supported mould frame, there is a risk of tilting or collapsing in the process of building construction, which has a very high risk. This paper from the high supporting mould technology, frame erection technology key points, safety monitoring and evaluation of the detailed description, and targeted to put forward the corresponding reasonable suggestions, in order to be able to protect the smooth progress of construction.

Keywords: civil engineering, high support mould construction, risk assessment

1. Introduction

The use of highly supported mould making process in construction projects can effectively improve the stress performance of the structure, greatly improve the stability performance of the structure, and improve the efficiency and quality of the construction.

However, since the use of highly supported moulds is very dangerous, construction companies must pay enough attention to their safety. Before construction, the bearing capacity, aggregate and height of the building should be carefully analysed in order to provide the necessary basis for the construction of high-quality projects.

2. High-support mould construction technology

For the high supporting mould project, “the safety management measures of the dangerous sub-parts of the project” made the following definition: “it refers to the height, span, construction load, concentrated load are not less than 8m, 18m, 15kN/m², 20kN/m formwork works and support system built on the concrete formwork support works . In engineering construction, the construction of highly supported formwork consists of two aspects: the first is the bracing system, and the second is the formwork system, which is the bracing and formwork of more than five metres in length.

3. High-supporting mould frame erection technology key points

3.1 Programme design

In the construction of highly supporting mould concrete structure, the bearing capacity and deformation of the bracket and template need to be calculated to ensure that it does not exceed the safety tolerance value. In the design of highly supported formwork, it is usually necessary to follow the principles of safety and economy, and select materials that can be used for multiple turnover to reduce construction costs.

In the design of highly supported moulds, the effects of two main types of factors on the strength, stiffness and stability of formwork and supports need to be considered, namely, the self-weight of construction materials and construction loads. In the construction design, the deformation of the calculation bracket is a crucial link, which needs to attract enough attention of the construction personnel.

If the calculated results do not meet the technical requirements of construction, you can re-select the template thickness, strength or support spacing on the basis of another trial calculation, until it meets the construction requirements.

3.2 Construction preparation

High-support formwork construction requires a series of steps to be followed, including site survey, design and release measurements, installation of high-support formwork, safety acceptance, structural construction and finally formwork re-

moval.

3.3 Material selection

Different types of formwork have significant differences in terms of purchase price, bearing capacity and weight. Technicians need to choose the appropriate type of formwork according to the actual situation of the project. When purchasing formwork, you can consider using materials such as lightweight steel or plastic formwork, which are relatively light and easy to handle and install.

3.4 Build Installation

As the construction of high support mould has greater danger, so the construction should be carried out in strict accordance with the specifications. The following are a few points to note in the process of high formwork installation:

(1) The road embankment must be adequately compacted. Before the commencement of the project, it is necessary to understand the situation of the construction site in detail, to ensure that the compacted embankment can meet the actual needs of the project construction, and to lay a solid foundation for the subsequent building construction work.

(2) Management of building materials is very significant in construction. Before starting the construction, the shape and labelling of building materials should be checked.

(3) During building construction, attention should be paid to the installation and erection of the multilayer panels.

During the construction of high formwork technology, operations must be carried out in accordance with strict control standards, with special attention paid to key aspects such as embankment compaction, management of building materials and installation of multi-storey slabs, in order to ensure construction safety and quality.

3.5 Monitoring and measurement

In the construction of highly supported moulds, the monitoring points for the uprights should be set at the locations of the most stressed columns and the worst stability at the edges of the braces. The test points should be set based on the areas of greatest stress, including column top horizontal displacement monitoring points, total horizontal displacement monitoring points of the braces, and support column adjustment monitoring points, and these locations should also be based on the dimensions of the support surfaces.

During the concrete pouring process, the staff must continuously monitor the changes in the support system. During parts assembly, each part must be numbered according to field conditions.

3.6 Pouring of concrete

When pouring concrete, construction workers must strictly follow the operating procedures to avoid concrete spillage and quality problems. Before pouring, the quality and effective performance of concrete materials should be checked, and the position of high support moulds and the horizontal axis and beam line should be strictly monitored to ensure compliance with the standards. In order to ensure the pouring uniformity and quality, the construction workers should start pouring concrete from the centre gradually to the periphery, and employ professional technicians to study and solve the safety hazards and quality problems. Attention also needs to be paid to the early management and quality inspection of concrete pouring to ensure high quality and safe construction.

4. Risk assessment

Ultra-hazardous and large sub-elements have high risks and safety hazards during the construction process and need to be constructed in accordance with the government regulations of the location where the project is to be carried out and the requirements of the corresponding construction specifications. In order to ensure the safety of the construction process of supporting moulds more effectively, it is usually necessary to use both traditional risk assessment and dynamic risk assessment to carry out safety assessment.

4.1 Traditional risk assessment

Currently, the LEC method is commonly used for risk assessment in the engineering construction process. The method is used to evaluate the hazards, which are mainly composed of three types of influencing factors, namely, the likelihood of accidents, the frequency of construction workers working in hazardous environments and the severity of the consequences. However, the LEC method also has some obvious shortcomings, which are mainly reflected in the following aspects:

(1) Greater subjectivity: Due to the greater subjectivity of the risk evaluation methodology, different evaluation experts do not have the same level of understanding of the risk of highly supported moulds, resulting in possible bias in the evaluation conclusions and possible inconsistencies in the evaluation results between different experts.

(2) Lack of dynamic analysis: This method lacks the analysis of the impact of dynamic control factors on the overall safety of the supporting mould in the construction process.

In order to reduce subjectivity and increase dynamism, more scientific and objective risk assessment methods are needed.

4.2 Dynamic risk assessment

There are various risk factors in the erection and use of overhead moulds, and the traditional static risk assessment is difficult to estimate these risks comprehensively. Therefore, dynamic risk assessment has been increasingly valued by project managers.

Therefore, before construction, it is necessary to study the unsafe factors of the supporting mould, monitor the various risk factors of the supporting mould in real time, and analyse and prejudge the degree of danger of the various risk factors to the supporting mould, which can be used to guide the actual construction and ensure the construction safety. Dynamic risk assessment can be carried out by using Bayesian network and its visualisation software (Genie software), which can analyse the correlation of the data of various influencing factors, and carry out deduction analysis based on probability. In the actual analysis process, Bayesian network construction is required with the help of relevant industry expert knowledge. The sample data can be obtained from the investigation reports of high-support mould collapse accidents in previous years, relevant research data and the experience of industry experts. The size of the sample number affects the reliability of the risk assessment of the highly supported moulds by each risk factor. Therefore, during the construction process, it is necessary to update the sample database of each risk factor on a regular and irregular basis, analyse the impact of changes in risk factors on the safety of the supporting mould in a timely manner, and establish a corresponding safety warning mechanism. This will help to effectively prevent the occurrence of accidents of highly supported moulds, safeguard the life safety of on-site construction personnel, and reduce economic losses.

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