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Blasting Demolition Technology of Reinforced Concrete Support for High-Rise Buildings

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Abstract

With the rapid development of urbanization, the available land area is becoming less and less, the development speed and construction scale of high-rise buildings are particularly large, and the quality problems caused by the application of traditional construction technology in the actual process of construction work are very serious. Concrete supported blasting demolition technology has been used more and more in high-rise buildings, and has made great achievements in use. This paper mainly analyzes the construction of high-rise buildings and the current situation of the use of reinforced concrete support blasting demolition technology in high-rise part-time jobs, which has a great role in promoting the implementation of high-quality construction operations of high-rise buildings, thus improving the quality and efficiency of high-rise buildings.

Keywords

High-rise building, reinforced concrete, Construction technology of blasting demolition

1. Introduction

The construction technology of blasting demolition with reinforced concrete support has a high stability when it is applied, and some projects are deep when they are constructed. For some places with high requirements on the safety of the surrounding environment, this technology has been widely used, and has achieved very good results when it is put into use. Especially for high-rise buildings, the scientific application of reinforced concrete support blasting demolition technology should be combined with the current situation to formulate a targeted construction plan. It is also necessary to carry out professional technical training for personnel according to the technical specifications to ensure that the staff can implement the work in strict accordance with the technical specifications, so that the high-rise building projects can be implemented with higher quality and provide guarantee for the progress and development of high-rise building projects in the future.

2. Analysis of key points of blasting demolition with reinforced concrete support

2.1 Analysis of construction embedded holes and later drilling

When carrying out the blasting demolition of reinforced concrete support of high-rise buildings, the embedded holes and later drilling are very important parts, which need targeted operations. There are two main ways of hole formation: mainly using embedded holes or manual drilling before the support blasting. The embedded holes need to be inserted with PVC pipes during the support pouring, and the hole cleaning operation shall be carried out before the blasting work [1]. When the embedded holes are used, the construction speed is relatively fast, which will not affect the construction of other projects inside the foundation pit. Therefore, this method is widely used in the blasting operation in an open place, and has achieved very significant results in practical application.

2.2 Analysis of foundation pit monitoring

When the monitoring and on-site inspection work is carried out, the stability of the foundation pit support structure must be determined so that the support system in the foundation pit can be in normal working condition. During the whole implementation process of this work, the construction personnel must strictly monitor the surrounding environment, so as to ensure that the surrounding environment is guaranteed when the construction work is implemented. Before the blasting work is carried out, the accuracy of the dynamic values caused by each link of the construction must be reviewed, and compared with the alarm values, so as to timely give feedback on the guidance of the construction, and ensure that the construction personnel can carry out the work reasonably according to the site conditions [2].

3. Analysis of supporting blasting network design

3.1 Analysis of design principles

When carrying out the design of the supporting blasting network, the operation must be carried out in strict accordance with the design principles, and the blasting treatment shall be carried out by using the high section non electric detonator in the hole [3]. The implementation of this principle is mainly to ensure the safety and reliability of the blasting network, and to avoid the quality problems caused by the blasting part to other parts during the blasting demolition [4]. During the blasting process, the main line and the straight line must be in a straight line to avoid harming the blasting network of the next wall. During the blasting process, the delay of the main line and the branch line needs to be calculated and arranged scientifically according to the design principles to avoid the impact of blasting vibration. Including the main line of the network, which mainly uses the double tube explosion transmission. Relatively speaking, the reliability of blasting network is high. Therefore, when designing the blasting network, designers need to conduct in-depth analysis of the relevant principles, clearly understand the characteristics of the design principles and the advantages in the application process, and improve the design quality of the supporting blasting network according to the current situation.

3.2 Network design analysis

There are many problems to be paid attention to when designing the supporting blasting network. According to the requirements of blasting outside the hole and in the hole, there is a big difference between the requirements outside the hole and inside the hole during the implementation of the design of the waist beam ring beam node network [5]. The designer shall first analyze the design requirements of the blasting network, so as to design the blasting network according to the standard specifications. In the application process of reinforced concrete support blasting demolition technology, the requirements for network design are particularly high. The network design is implemented according to the blasting demolition specifications, so that the quality of network design can meet the actual needs in the process of later blasting work. The hole layout design is a very important part. The hole layout mainly includes two parts: row spacing and hole depth. When implementing the design, the standard operation should be carried out according to the hole diameter. There is a very important relationship between the two and the location of the blasting body. After obtaining a particularly rich blasting effect, the determination of explosive unit consumption must be targeted [6].

4. Safety Strategy of Reinforced Concrete Supporting Blasting Construction for High rise Buildings

4.1 Analysis of safety control standards and basis

The blasting safety control is particularly important. It must be operated in accordance with the national safety control standards. The calculation of the safety distance during blasting must be based on the surrounding environment and the structural characteristics of the blasting body. The implementation of the blasting demolition safety rules and regulations has an impact on the development of blasting safety management related work and the overall quality of the demolition process [7]. During the implementation of safety control, the staff shall carry out the work scientifically according to the standards and specifications, and the control standards and basis can be fully implemented as far as possible, so as to lay a foundation for the high-quality implementation of reinforced concrete support blasting construction. The construction scale of high-rise buildings in China is particularly large, and the relevant safety control standards are not perfect enough, which needs to be continuously optimized according to the actual application needs [8].

4.2 Analysis of blasting safety assessment

During the construction of supporting blasting, the safety assessment affects the quality of blasting construction. In this process [9], the characteristics of blasting environment need to be taken into account. First of all, the safety assessment personnel should make an actual investigation on the environment of the construction site, record the results [10].

Implement the safety assessment according to the data analysis results, understand the probability of safety accidents during blasting through the implementation of the safety assessment, and make corresponding plans to prevent accidents. The safety assessment personnel shall analyze the standard rules and regulations of concrete support blasting construction when working, so as to evaluate according to the requirements of the rules and regulations.

4.3 Management of blasting vibration speed

According to the requirements of China's blasting standards, it is necessary to reasonably control the vibration velocity of the protected buildings during blasting demolition, and allow them to use the vibration velocity calculation formula for corresponding calculation and analysis within the safe speed range. Once the vibration velocity calculation is not implemented according to the requirements of the standard formula, it will cause serious harm to the accuracy of the calculation results.

The minimum resistance line W of blasting technical parameters is calculated as the shortest distance from the embedded hole of reinforced concrete support to the free face, and the support thickness H is obtained. The hole depth L is planed, and the formula is W=H-L. The distance between explosive and space is calculated as follows:

$$A: A = (1.5 \sim 1.8) \times W$$

The row spacing between charge holes is as follows:

$$B: B = (0.85 \sim 0.9) \times A$$

Charge hole depth:

$$L: L = (0.67 \sim 0.7) \times H$$

So as to define the charge quantity filled in the single hole:

$$q: q = K \cdot V$$

The larger reinforced concrete structure is obtained by combining the reinforcement ratio of the supporting beam with the formula:

$$K = 0.7kg / m^3 - 0.9kg / m^3$$

Volume to be supported by single hole V:

$$V = A \times B \times H$$

The obtained supporting blasting parameter data is shown in Table 1.

Table 1. Supporting blasting parameters

Blasting position	Hole depth cm	Aperture mm	Resistance line cm	Hole pitch cm	Row spacing cm	Row number	Single hole charge g
Encirclement	65	38	30	100	30	3	300
Beam	65	38	30	100	30	2	300

During the calculation, it is necessary to analyze the data information related to geology, reasonably calculate the vibration speed according to the geological characteristics of the site during construction, and ensure that the blasting speed can reduce the quality problems of buildings, especially safety accidents. If the vibration speed exceeds the standard range, it will cause harm to the overall quality of the building and affect the normal use of the building, for Figure 1.

Calculation of maximum amount of primary explosive $Q_{\max}$:

$$V_C = K(\sqrt[3]{Q_{\max}} / R)^a$$

Combined with the topographic and geological conditions and the attenuation of correlation coefficient, in the soft delay of the explosive medium, K=250-350 and a=1.8-2.0 are finally obtained, and the maximum blasting charge is controlled within 30 kg, so as to obtain the blasting vibration speed at different distances as follows Table 2.

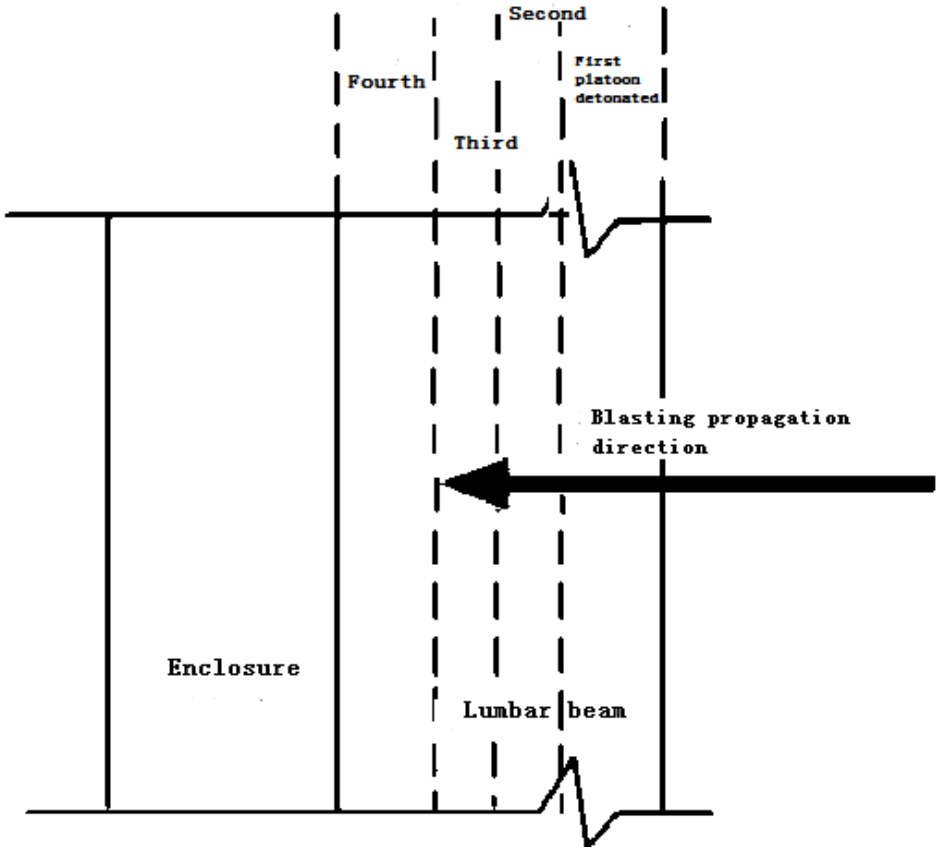

Figure 1. Initiation Sequence.

Table 2. Vibration Speed at Different Distances of Maximum Uniform Explosive Amount

No	Dosage kg	Distance m	K	a	Vibration velocity cm*s^{-1}
1	30	50	250	1.8	1.68
2	30	80	250	1.8	0.72
3	30	100	250	1.8	0.48
4	30	120	250	1.8	0.35
5	30	180	250	1.8	0.17
6	30	200	250	1.8	0.14

It can be seen from the table that the blasting vibration speed at 50m position is 1.68cm * s-1, which is 2.7-3.0cm * s lower than the safety specification.

4.4 Analysis of safety management

During the reinforced concrete support blasting construction of high-rise buildings, the engineering technology department shall issue a reasonable construction plan during the blasting construction. During the blasting work, the safety disclosure work shall be strictly implemented. During the blasting work, the safety supervisors shall not conduct on-site supervision. The charging and wiring work must be carried out by professional personnel, and the miscellaneous personnel shall be removed [11]. If the blasting work is not carried out according to the standards, the safety supervisor can stop the blasting personnel according to the requirements of the standards and specifications to avoid the occurrence of personal safety accidents during the work, in Figure 2.

Before blasting, relevant department personnel are required to set up corresponding safety warning lines, and special safety personnel are required to guard the warning area to prevent unauthorized personnel from entering. If blasting is not carried out in time due to special reasons, special safety personnel must be assigned to guard at night to prevent the

occurrence of safety accidents during blasting. Safety management is very important in blasting demolition construction, which can avoid the quality impact of safety accidents on the implementation of the overall work project [12].

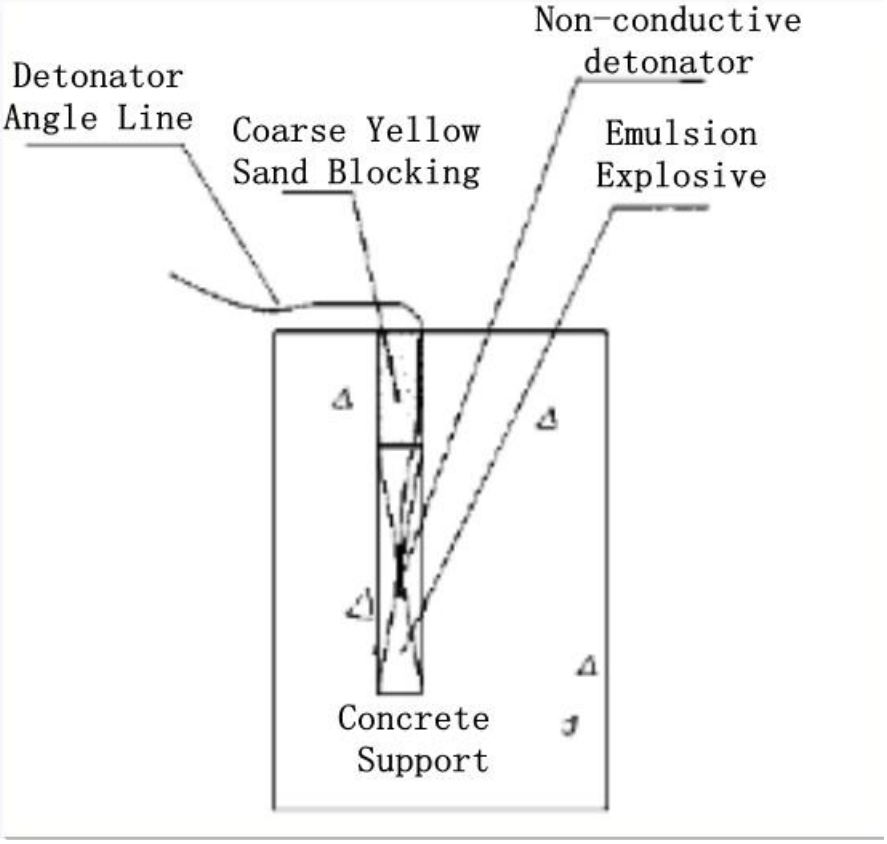

Figure 2. Loading of Blast Holes.

5. Conclusion

To sum up, in the construction of high-rise building projects, the reinforced concrete support blasting has made up for the shortcomings of the traditional construction technology. The traditional demolition method is mainly used to carry out underground demolition first, which leads to the construction personnel being unable to work in a timely manner and has a great impact on the control of the construction period of the project, thus causing the danger of foundation pit collapse due to the long application of the support system, It has greatly affected the construction progress of the project, so it is particularly important to apply the reinforced concrete technology during the construction operation, which can improve the problems existing in the implementation of the existing blasting demolition work, so as to lay the foundation for the implementation of the later high-rise building construction work, ensure that the high-rise building construction can be carried out in accordance with the technical specifications for the blasting demolition of reinforced concrete support, so as to improve the overall quality of the project.

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