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Study And Analysis Of Key Construction Techniques Of Fabricated Steel Structure

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ABSTRACT. *This article through to a prefabricated steel frame high-rise building engineering practice, analyzes the method of steel framework and the structure of the retaining structure and installation construction difficult point, carry out the study of prefabricated steel structure, analysis of the key construction technology of application in engineering practice, summed up some prefabricated steel structure construction technology, the key problem of prefabricated steel structure construction technology in China has certain guiding significance.*

KEYWORDS: *assembly type, steel structure, key construction technology*

1. Significance Of Prefabricated Steel Structure Construction

At present, the proportion of prefabricated buildings in new buildings in China is still relatively low, and the proportion of prefabricated steel structure is very small.At present, the emphasis is to research and develop the assembly type high-rise steel structure innovation system and rapid assembly type node structure, envelope system, rapid assembly construction technology and other industrialization system[1].If we can make a breakthrough in technology, it will promote the transformation and upgrading of China's construction industry.

Prefabricated steel structure with factory prefabrication, field installation characteristics, through the combination of network computer and CNC machine tools, designers in the interior design, the production line by the factory to complete the production, with high efficiency and high precision[2].The construction of prefabricated steel structure is basically dry operation, which improves the construction efficiency. Because there is no need to support the mold maintenance, to avoid the impact of natural factors on the construction. Mechanized installation method, with fast, efficient, simple advantages, greatly shorten the project construction cycle.1.3 flexible spatial arrangement of fabricated steel structure.

Prefabricated steel structure has a large room size, most of the walls are non-load-bearing walls, and the layout of the plane space is free. After the users move in, they can arrange and divide the space according to their own needs, without affecting the safety of the overall structure. Because of the high strength of steel, the

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section size of prefabricated steel structure is smaller than that of traditional reinforced concrete frame structure[3]. In addition, after accurate design, indoor hvac equipment, water and electricity pipelines and suspended ceiling can be integrated into the wall and floor, realizing the building's intelligent integrated wiring system, ensuring a more perfect indoor space layout, and making the floor space more flexible.

The main load-bearing members of the prefabricated steel structure are light hot-rolled section steel and thin-walled steel pipe, so the section force is more reasonable and the dead weight is lighter. At the same time, the weight of prefabricated steel structure is 30% less than that of traditional cast-in-place concrete structure under the same design condition. Due to its high strength, good ductility and strong plastic deformation capacity, the prefabricated steel structure has unparalleled seismic performance. At the same time, lower dead weight can reduce the cost of infrastructure, transportation, installation costs, etc.

2. Project Overview

The prefabricated steel structure of S project mainly focuses on # 1 building and # 2 building. No. 2 building and no. 1 building mirror symmetry, structural forms are steel frame structure, steel frame by stiffness column, box column, floor h-type steel beam and square pipe support. The building structure has one underground floor and 21 floors above ground, with the standard floor height of 4.2m and the main tower building height of 89.6m.

3. Construction Technology Of Steel Structure

1) steel column segmentation. Subsection of steel members is an important working procedure of steel structure construction. Reasonable subsection can shorten the construction period of steel structure and improve the installation quality of steel structure.(2) the components can meet the requirements of transportation size restrictions after segmentation. The most economical size: length 13m, width 2.4m, height 2.8m;(3) it can meet the requirements of long-distance transportation, and permanent deformation should not occur during transportation. The steel column of this project is divided into 2 floors and 1 section within the working radius. The steel column section point is set at 1.2m above the floor level. If the section weight exceeds the lifting weight limit of tower crane, the car crane shall be adopted for hoisting.

2) steel column component yard. Also to have certain regulatory requirements in terms of component to pile up, to follow the principle of on the premise of convenient installation, sequentially stacked, in addition, will also notice the basic information of the components and the relevant identification on the outside show it, convenient for use, the key is to classify stacking, can on the basis of H type steel beam or box column dimensions are classified, and the main component needs to be between 100 cm of the single pile, the time component will be wood to bedding to

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pile up and down two floors. It is worth noting that, in the specific component stacking site, need to be based on the actual situation of the site to be practical and realistic arrangement of stacking, the need for the support cushion must be set up, to avoid the deformation caused by the inability to use. In addition to stacking components to comply with the standards, the site drainage and other aspects should also be done to avoid water seepage and other problems affecting the use of components.

3) steel column installation. For lifting steel column members, the lifting point of the steel column shall be set at the connecting lug plate pre-welded on the upper part of the steel column. Before installation, the positioning line shall be popped up on the butt port of the upper and lower column as the installation reference line. Install bolts to temporarily fix the connecting plate, align the center line around the upper column with the center line of the lower column, and cut off the temporary connecting plate after welding, as shown in figure 3-3 and 3-4 below. Vertical adjustment of steel column alignment is corrected by jack. Two theodolites measure the vertical of steel column, as shown in figure 3-5 below. After the calibration is completed, tighten the connecting plate bolts and start welding. The torsion adjustment can be corrected by installing jacks on the four sides of the column through the bolt anchorage pad on the four faces of the steel column through the steel column lug plate. After the elevation adjustment is hoisted in place, the upper and lower lugs are fixed by the temporary bolts through the connection plate, and the clearance between the columns is adjusted by pry bars and jacks.

4) welding of steel column. The section form of the steel column is box type. The steel column is transported to the site in sections and welded at high altitude. As far as the whole frame is concerned, the welding construction of steel column should be carried out from the intermediate members of the whole structure to the left and right after forming the frame. The welding method adopts the welding method of base manual welding, semi-automatic welding middle filling and cover surface. All welding parts with liner plate are semi-automatic welding with CO2 gas protection. When welding, pay attention to the same speed in the opposite direction. On the contrary, welding shall be carried out in the order of first welding the opposite side to ensure the accuracy of operation. During the rainy season, it is necessary to prevent corrosion caused by rain water pouring into the steel column and welding quality decline caused by rain water. Before the rainy season, rain-proof measures should be taken for welding in advance.

How to deal with deformation coordination of steel structure in construction. During the installation of the main body of the steel structure, as the height of the main structure increases, the self-weight load also increases. How to ensure that the deformation of the frame during the construction will not affect the safety of the structure and the safe use after completion is the key point in the construction. Solution: one is in the cast - in - place floor reserved after pouring belt. Second, adjust the steel column field installation length. Welding quality control in adverse environment. The main body of the steel structure has a long construction period, experienced the four seasons of spring, summer, autumn and winter, especially the high building height, and the wind load has a great impact on the building. Maintain

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welding quality of steel structure in strong wind condition. According to the environmental characteristics of the four seasons, a targeted (especially in winter and rainy season) welding quality control program is developed to precisely control the quality.In order to improve the welding efficiency, gas shielded welding is adopted at the lower level of the structure, special welding wind shelter is set at the upper level of the structure, in addition, arc welding can be adopted for welding to better ensure the welding quality.

High - rise building requires high engineering survey control. Measurement is the control stage of engineering quality, which directly affects the installation quality of steel structure. Compared with common structures, high-rise buildings require more strict control accuracy and measurement is more difficult. According to the background of this project, the overall measurement idea of “underground outdoor control method + upper internal control method” is adopted, and the measurement principle of “from the whole to the part” is followed. The specific measurement idea is as follows: according to the coordinates and elevation of control points at the municipal level, retest the reference points provided in the drawings to verify their accuracy. After the base point retest, the “external control method” is adopted to arrange the main control points around the assembled steel structure, and the control points are encrypted around the project. Based on the main control point and the encrypted control point, the control network of the first floor plane is determined by the method of traverse round-trip observation. The laser plumb instrument is used to measure the height of the control points.

Safety measures for working at height. The installation of high-rise steel structure needs to develop special safety protection plan for high-altitude work, and safety construction is also the key point to be considered in the installation of this project. When the installer walks on the steel girder, safety rope shall be set between the steel column and the steel column. Steel ladder shall be installed on the steel column for the convenience of the operators, and the operation platform shall be welded to the guardrail. The outer facade of the assembled steel structure is separated by one layer and laid with a web around the steel structure. The steel girder around is welded with lugs, the web and lugs are hinged, and the upper web and lower web are tied with steel wire rope.

Reasonable interpenetration of construction procedure of steel member installation and laminated plate installation. The installation of the upper beam of the assembled steel structure will hinder the hoisting of the large laminated plates in the lower layer. Considering this construction difficulty, the steel column is divided into two sections, and the steel column is suspended by two layers. The installation of the steel column, the main beam of two layers and the beam of the next layer is completed first, and then the hoisting of the laminated plate is carried out, followed by the installation of the secondary beam of the upper layer, and finally the hoisting of the upper laminated plate.

4. Conclusions

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In order to promote the transformation and upgrading of China's construction industry, we should make every effort to promote the innovation of construction methods, with the focus on promoting the use of prefabricated steel structures, and build a number of high-quality prefabricated steel structure demonstration projects through standardized design, factory production, prefabricated construction, integrated decoration and information management. Carry out research on the safety of new system and new technology to ensure the safety and environmental protection of assembled steel structure, advanced technology, conforming to the module standard, and conducive to the promotion and use.

Reference

[1] Yang shichao, Li jianxin(2014). Prefabricated exterior panel system for steel structure building. Construction science and technology, no.5,pp. 64-65+68.
[2] Lu xiuxiu, Wang yan(2016). Research progress on prefabricated beam-column joint of steel structure. Steel structure, vol.31, no.10, pp.1-7.
[3] Lu junfan, Wang jia(2014). Development and application of prefabricated steel structure housing system. Urban housing, no.8, pp.26-29.