

Construction Technology of Steel Structure Prefabricated Panel Wall

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Abstract: Prefabricated steel structure buildings and prefabricated partition walls generally have many joints and pores. Therefore, prefabricated steel structure prefabricated panel walls and steel structures can achieve high air tightness requirements, which can be solved by deepening the connection between prefabricated panel walls and steel columns, steel beams, and gaps, and conducting air tightness treatment. Based on an example of a steel structure residential building project in Yinzhou District, Ningbo, this article focuses on introducing the connection details and gap treatment of prefabricated panel walls, steel columns, and steel beams, and analyzing key technical control points.

Keywords: Prefabricated wall panels, Node connection, Construction quality.

1. Introduction

With the continuous development of China's economy, the demand for energy is also increasing. Among the increasing total energy consumption, building energy consumption accounts for approximately 11% to 25% of the total energy consumption; Faced with the increasingly tense energy issues, the issue of building energy conservation has attracted high attention from the country, and buildings cannot do without materials. Therefore, the application of building energy-saving materials is an effective method for energy conservation and consumption reduction. At present, the country is paying more attention to sustainable development and increasing efforts in environmental governance. Traditional building materials consume a large amount of energy, which is not conducive to sustainable development. Moreover, the intensity of dust control is constantly increasing, and the construction of traditional building materials is not conducive to environmental development. Promoting energy-saving building materials is bound to become the main direction of future development. In addition, compared to traditional construction methods, steel structure prefabricated buildings have obvious advantages. The most concentrated manifestation is that they can ensure product quality while saving a lot of resources, achieve multiple styles, and greatly accelerate the construction period. While ensuring cost control, they can achieve energy conservation and emission reduction. At present, steel structure prefabricated buildings Standardization and scaling have become a trend in building construction.

2. project Overview

The 5th building of this project is a steel frame structure residential building, with a building height of 50.5 meters. The steel frame structure of Building 5 mainly consists of steel tube concrete columns, steel tube columns, H-shaped steel beams, etc. The floor slab adopts a vertical pole support system cast-in-place slab, the outer wall is UAAC board wall, and the inner partition wall has 100mm and 200mm ALC board walls.

3. Construction Technology for Connecting UAAC External Walls with Steel Columns

This project uses a structural column as the connection between the UAAC exterior wall and the steel column. For the effective connection between the UAAC exterior wall and the structural column, pre embedded connection nuts are installed on both sides of the UAAC large plate, from the bottom to the upper end, at intervals of less than 1000mm, with a pre embedded depth of 400mm. M12 bolts are then fixed to the UAAC large plate through nuts, and the length of M12 threads during on-site construction is greater than or equal to 80mm. Setting pre embedded connection nuts for connection can greatly enhance the connection strength between concrete structural columns and UAAC wall panels, enhance the overall integrity of the building and the safety and durability of the engineering structure.

The connection between steel columns and structural columns needs to be welded with a length of 60mm Φ 13 bolts, with a vertical spacing of less than 300mm and evenly welded bolts. The appearance surface of the bolt is free of defects such as rust, oxide skin, burrs, etc. After welding, check whether the bolt is vertical, whether the weld seam is uniform, and whether there is deviation welding, cracks, etc. The steel column is integrated with the UAAC exterior wall by gripping the structural column with bolts, ensuring structural safety and durability. The construction drawings are as follows:

4. Construction technology for connecting UAAC exterior walls with concrete floor slabs

The UAAC board wall is erected at the position controlled by the snap line. When there is no guide wall, a 20mm gap is reserved between the board wall and the concrete floor slab for mortar pouring. Embedded in concrete floor slab Φ 8 steel bars are bent and anchored out of the floor plate, and one piece is pulled and placed in a 50mm deep arc groove at the lower part of the UAAC Φ 6 full-length steel bars, both sides of the groove, namely the inner and outer sides of the UAAC panel

type JS waterproof coating; Finally, the construction of exterior wall finishes.

② The treatment method for the bottom seam of the UAAC large board is to perform the same basic layer treatment, clean up the residue on the outer surface, and prevent quality problems such as peeling during subsequent painting; After the base layer is treated, a special layer of grouting material is applied first, and then a layer of waterproof sealing mortar is applied after setting; Then brush acrylic lotion once; After painting, hang 6mm thick crack resistant mortar with built-in alkali resistant fiberglass mesh cloth to prevent cracking of the front and rear materials after painting; Apply three layers of 1.5mm thick I-type JS waterproof coating; Finally, the construction of exterior wall finishes.

The inner side of the UAAC board wall does not require waterproofing, only a layer of alkali resistant fiberglass mesh cloth needs to be hung after the base layer is treated, and the interior wall decoration construction can be completed.

7. Construction Technology for Connection between ALC Internal Partition Wall and Steel Beam

The ALC internal partition walls in this project are 200 and 100mm thick. The upper part of the 200mm thick ALC partition wall is connected to the steel beam using a U-shaped clamp method, while the upper part of the 100mm ALC partition wall is connected to the steel beam using a pipe clamp method.

Before installing the 200 thick ACL board, it should be ensured that the base floor is flat. If the flatness does not meet the standard, 1:3 cement mortar can be used for leveling; Snap line positioning ensures accurate installation position of wall panels; Install U-shaped cards on the top of the board. Install a U-shaped card on the top of the ALC board in advance, with one U-shaped card set 80mm away from each board end; Then, base the mortar on the ground or flip bucket, using specialized bonding mortar; A gap of 10-20mm should be reserved between the board and the main structure. The installation sequence of the inner wall panel should be carried out sequentially from the structure, and the free end should use a whole panel; Adjust based on infrared. The tenon needs to be inserted into the tenon groove, and the width of the board joint should not exceed 5mm; U-shaped card fixed welding, welding should be uniform, without cracks, melting, scratches, welding nodules, bites, burns, needle shaped pores and other defects. The welding area should be free of residue and must be treated with rust prevention; Next, install the second ALC board wall, install the U-shaped card, base mortar, vertical board, and adjust the wall panel to fix and weld the U-shaped card. Repeat the above construction steps; After the installation is completed, use a grouting gun to inject the special bonding mortar between the board joints, and stick the crack resistant mortar with a built-in heat-resistant fiberglass mesh cloth, extending 100mm on both sides of the mesh cloth. The joint of the wall panel should ensure full grouting, and the width of the joint should not exceed 5mm; After the construction of the ALC inner partition wall is completed, use a grouting gun to inject the special bonding mortar between the board and the steel beam, and compact and fill it.

Before installing the 100 thick ACL board, it is necessary to ensure that the base floor is flat. If the flatness does not meet the standard, 1:3 cement mortar can be used for leveling;

Snap line positioning ensures accurate installation position of wall panels; Install pipe clamps on the top of the plate. Install a pipe clamp on the top of the ALC board in advance, with one pipe clamp set 80mm away from the end of each board; Then, base the mortar on the ground or flip bucket, using specialized bonding mortar; A gap of 10-20mm should be reserved between the board and the main structure. The installation sequence of the inner wall panel should be carried out sequentially from the structure, and the free end should use a whole panel; Adjust based on infrared light; The pipe clamp should be welded and fixed to the steel beam, and the welding should be uniform, without cracks, melting, scratches, welding nodules, bites, burns, needle shaped pores and other defects. The welding area should be free of residue and must be treated with rust prevention; Next, install the second ALC board wall, install the pipe clamp, base mortar, vertical plate, adjust the wall plate, weld and fix the pipe clamp, and repeat the above construction steps; After the installation is completed, use a grouting gun to inject the special bonding mortar between the board joints, and stick the crack resistant mortar with a built-in heat-resistant fiberglass mesh cloth, extending 100mm on both sides of the mesh cloth. The joint of the wall panel should ensure full grouting, and the width of the joint should not exceed 5mm; After the construction of the ALC inner partition wall is completed, use a grouting gun to inject the special bonding mortar between the board and the steel beam, and compact and fill it.

8. Detail Quality Control

8.1. installation precision control

The installation accuracy of prefabricated wall panels is mainly reflected in the axis position, wall verticality, wall flatness, joint width, internal and external angles, and hole displacement. Therefore, the installation of prefabricated wall panels requires laser level control to avoid affecting the subsequent plastering thickness control.

8.2. Axis position control

Before installing prefabricated wall panels, the position of the wall axis must be rechecked to ensure that the deviation of the wall axis does not exceed 3mm. After prefabricating the wall panel, wooden wedges can be inserted along the width direction of the panel at the upper end to temporarily fix the panel, ensuring that there is no movement of the wall panel during subsequent installation.

8.3. Joint width control

When splicing wall panels, the seam width of the panels should not exceed 5mm. During installation, the squeezing method should be used to ensure that the seam is full of grout. A 20mm gap should be reserved at the connection between the wall edge and the top and the main body of steel structures such as columns, beams, and plates. Elastic materials should be used to fill the gap. If there are fire protection requirements, fire-resistant materials should be used to fill the gap.

8.4. Wall flatness control

During the installation process of prefabricated wall panels, each panel needs to be calibrated for local flatness between the installed panels. At the same time, after a certain length of installation, the overall flatness of the wall needs to be checked and controlled within 3mm.

8.5. Material moisture content control

The high moisture content of prefabricated panels can cause uneven water absorption at the mortar joints, leading to uneven shrinkage and ultimately cracking. Because the boards are pre fabricated and require material protection until the completion of construction, waterproofing measures need to be taken during transportation. Once the boards come into contact with rainwater, they may crack, and during storage, they should also be placed in accordance with the requirements. They should not be used in damp areas and should be placed in a dry indoor environment, If conditions limit, it is necessary to select suitable areas for outdoor stacking based on the actual situation, and take cover measures to avoid interference from rainwater or other factors. There are also requirements for the stacking site, ensuring that the site is hard and flat, and there is no accumulated water. The boards should be isolated from the ground to avoid direct stacking. They should be close to the project site and avoid secondary handling problems due to distance during use. Prefabricated panels that have been soaked in rain cannot be used directly. They must be dried and tested for moisture content before being used.

8.6. Full mortar

Before installing the next wall panel, the installed board or structural end should be moistened with mortar roller brush, and the mortise and groove of the board to be installed should be evenly plastered with mortar. After installation, use a grouting gun to inject the special bonding mortar between the board joints to ensure that the mortar is full. Before the filling mortar inside the board joint is completely hardened, the board must not be subjected to harmful vibration and impact.

8.7. Splicing treatment of different materials

20mm should be reserved at the connection between the upper and lower parts of the prefabricated wall panel. After

the installation of the lower part is completed, grouting is required, and the upper part needs to be filled with plain concrete. After the mortar has completely dried, an alkaline fiberglass mesh cloth with a width of 100mm should be installed at the junction.

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