

Key Technologies for Unsupported Construction of Reinforced Truss Floor Support Plates in Large Exhibition Hall Conversion Structures

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Abstract

The Hangzhou Grand Exhibition Project is a large-scale exhibition hall transformation structure project. During the construction process, reinforced floor slabs play an important role as the main supporting element of the structure, playing a crucial role in the stability and safety of the overall building. In terms of construction technology, carrying out construction without support is one of the characteristics of this project, which requires the construction team to have rich experience and technical capabilities. To ensure the quality of the project, the project team needs to plan the construction steps reasonably, adopt appropriate process measures, and ensure the quality control of each link. At the same time, the project team also needs to closely communicate and coordinate with the design unit, supervision unit, and relevant departments to ensure that the construction process complies with national standards and regulations. Through scientific and reasonable construction techniques and strict quality management, the project is expected to be successfully completed and provide extraordinary display effects for the exhibition industry in Hangzhou.

Keywords

Reinforced Truss Floor Support Plate; Large Exhibition Hall Conversion Structure; Unsupported; Construction Technology.

1. Introduction

Unsupported construction of steel truss floor slabs is a commonly used technique in construction, which can effectively simplify the construction process, improve construction efficiency, and reduce the impact on the environment. The key to this technology is to achieve unsupported construction of the support plate, which means completing the installation and adjustment of the support plate without using traditional support methods. The construction technology of steel truss floor support plate without support is of great significance in improving construction efficiency and quality. Through reasonable design and precise construction, the construction period can be effectively reduced, costs can be lowered, and the structural stability and safety of the building can also be ensured.

2. Features

Compared with ordinary cast-in-place reinforced concrete floor slabs, steel truss floor support plates can be directly laid on steel beams and then subjected to simple steel reinforcement engineering construction. The lower part of the system does not require the installation of a supporting formwork system. Before the concrete solidifies and hardens, the strength and stiffness of the entire floor slab, the quality of the concrete, the quality of the steel truss itself, and the loads during the construction process are all borne by the steel truss. Based on the characteristics of the Hangzhou Grand Exhibition

Project, steel bar truss floor support plates were selected. There is Hangzhou Metro Line 1 passing through the middle corridor, and many structures have large-span transfer beams. In order to avoid the transmission of large loads on the subway tunnel and achieve reasonable stress, the steel bar truss floor support plate without support process was chosen.

3. Key Technology

3.1 Deepening Design of Construction Nodes for Floor Slab

According to the project drawing design, the upper and lower chords and web members of the floor support plate should be made of hot-rolled HRB400 grade steel bars, and the bottom mold should be made of 0.5mm thick galvanized sheet. When laying, the floor support plate intersects with concrete components such as concrete beams and shear walls, and the stress situation of the floor support plate varies due to the placement direction, resulting in diverse node forms at its connection points. Therefore, it is necessary to deepen the design of winter nodes to achieve reasonable stress characteristics and fully utilize the superior performance of the floor support plate.

3.2 List of Reinforcement Building Materials

Table 1. List of Reinforcement Building Materials

		Template TD6a-220	Template TD6a-220
Upper chord reinforcement		12	12
Upper chord reinforcement		10	10
Web reinforcement		6.5	6.5
ht		220	220
Maximum unsupported span during construction phase (m)	simply support	4.5	3.8
Floor thickness (mm)		250	300

(1) Material Description: The upper and lower chords of the steel frame template are made of hot-rolled steel HRB400 grade web member steel and cold-rolled round steel 550 grade. The yield strength of the galvanized layer on both sides is not less than 260N/mm², with a total of not less than Z120.

(2) When the span of the slab exceeds the maximum unsupported span during the construction phase, reliable temporary support should be added within the span range of the slab.

(3) The bottom formwork steel plate is made of 0.5mm thick galvanized steel plate.

3.3 Connection between Steel Beam Nodes of Floor Slabs and Concrete Components

At the connection node between the floor support plate and the shear wall, when the floor support plate is perpendicular to the shear wall, additional steel reinforcement measures are taken. If the floor support plate is placed parallel to the shear wall, the equal strength steel bars perpendicular to the direction of the steel truss will be used as its connecting components. When the connection node between the floor slab and the concrete beam is parallel to the beam, the steel bars need to be anchored into the beam. When arranging the vertical beam, additional steel bars and temporary supports need to be installed at the ends. Support both sides of the beam with wooden blocks, and replace the edge of the floor slab with iron nails at the top of the beam with iron nails @ 200 to reinforce the top of the beam side formwork with a long wooden block. At the connection node with the concrete slab, when the floor slab is perpendicular to the end steel beam, the cast-in-place slab reinforcement needs to anchor a certain anchoring length into the floor slab.

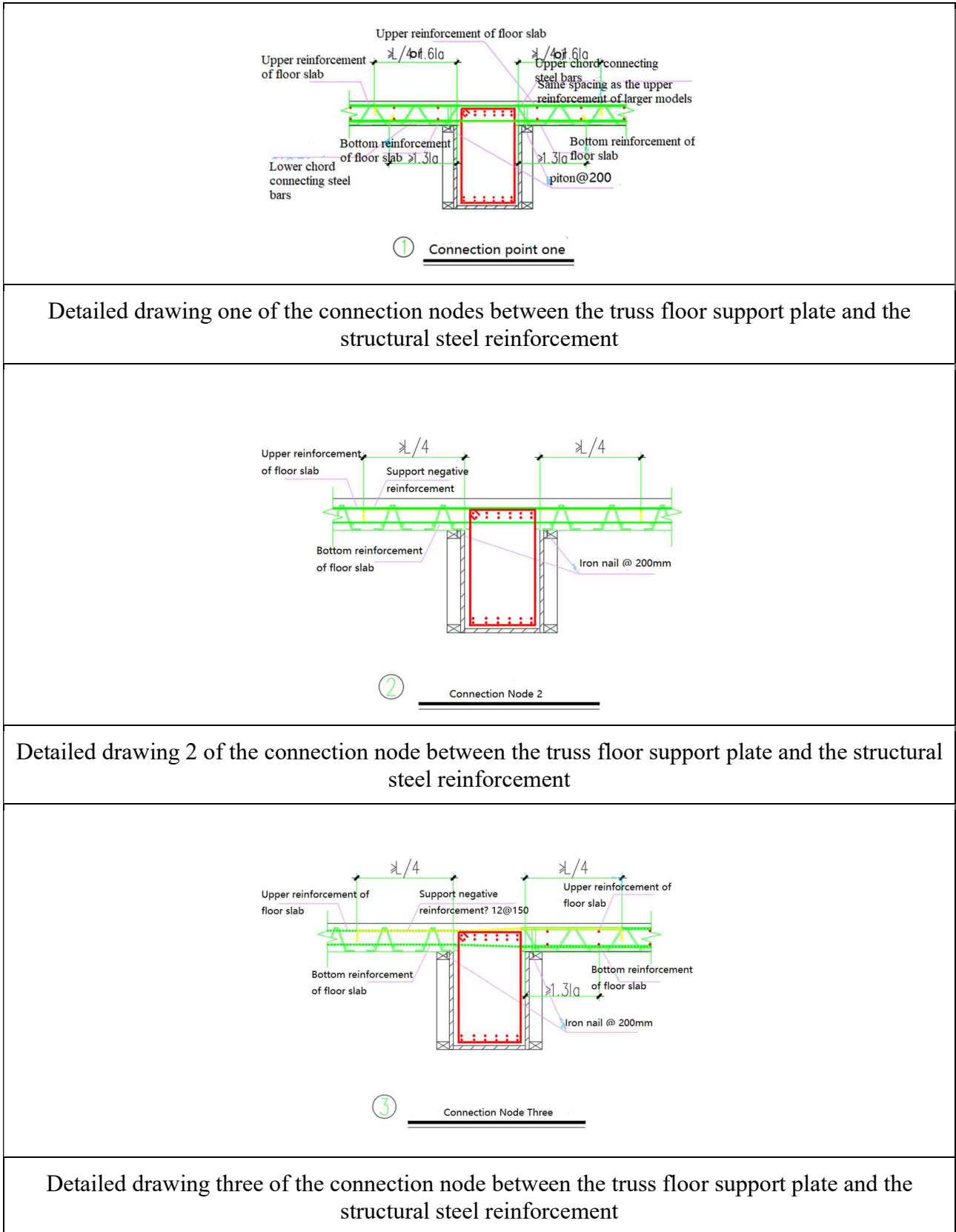


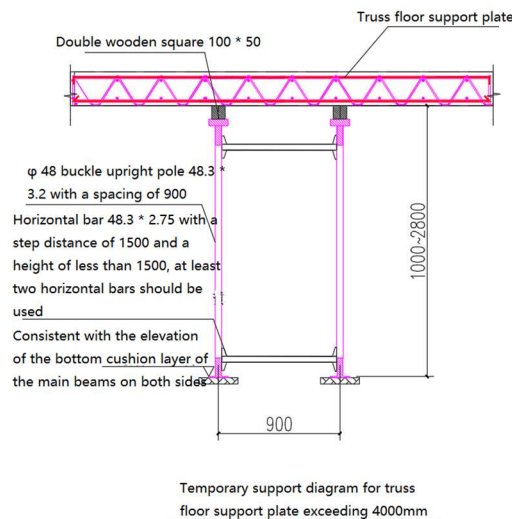
Fig. 1 Detailed drawing of the connection node between the truss floor support plate and the structural steel reinforcement

3.4 Temporary Support

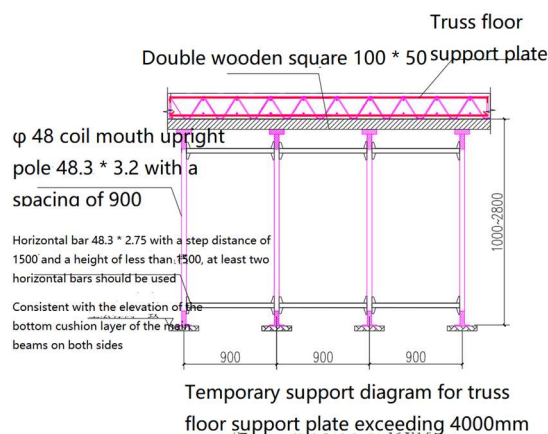
Based on the thickness of the first floor slab of 250mm, the selection of floor support plates is determined as TD6a-220. Temporary support is required for floor positions with spans greater than

or equal to 4.0m; The selection of the floor support plate with a thickness of 300mm is determined as TD6a-250. According to the selection of the floor support plate, temporary support needs to be added at the position of the floor slab with a span of 4.0m or more. The temporary support is a double row buckle type scaffold.

1. For areas where the span exceeds the allowable span of the truss plate, a one-time temporary support must be installed perpendicular to the direction of the truss plate at the mid span of the plate;
2. Temporary support adopts socket type buckle frame with a longitudinal and transverse distance of $900 \times 900\text{mm}$, spacing 1800mm ;
3. The support top is equipped with 50×100 full length double wooden blocks, and the two ends of the wooden blocks are connected and fixed with nails to the beam side formwork wooden blocks.
4. Install socket type buckle support frames for the truss floor support plates at the basement outdoor walls on both sides of the north and south (as the exterior walls of the basement on both sides have been completed, the floor support plates need to be supported).



Schematic diagram of temporary support for reinforced truss floor slab (cushion layer: 300mm) \times 300mm \times 100mm C20 concrete)



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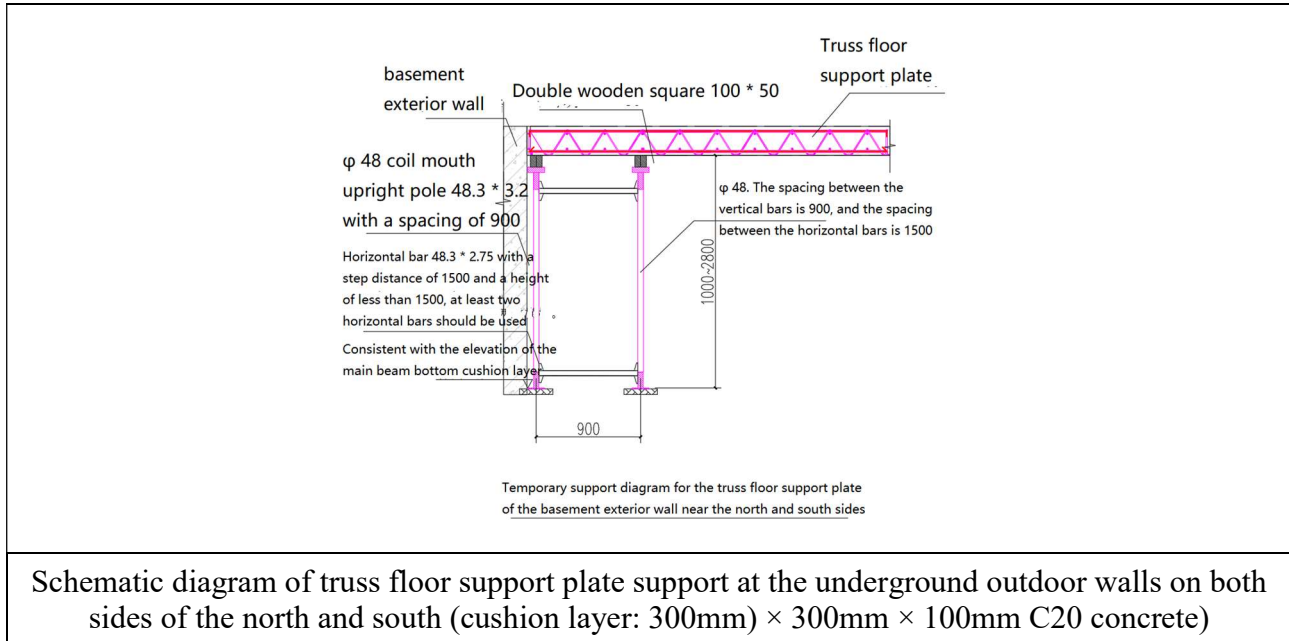


Fig. 2 Support diagram

3.5 Concrete Work

- 1) Concrete pouring should comply with the relevant provisions of the national standards "Code for Construction of Concrete Structures" GB50666 and "Code for Acceptance of Construction Quality of Concrete Engineering" GB 50204.
- 2) Before pouring concrete, the accumulated dust and welding slag on the bottom formwork of the floor slab should be cleaned up in a timely manner. When pouring concrete, it is not allowed to cause impact on the prefabricated steel bar truss floor support plate, and the pump concrete pipeline support shall not be directly supported on the formwork of the prefabricated steel bar truss floor support plate. When pouring concrete, it is advisable to pour it in the area directly facing the steel beam or temporary support. The pouring range or temporary accumulation caused by pouring concrete should not exceed 1/6 of the span range of the steel beam or temporary support on the floor slab, and it should be quickly spread out in all directions to avoid excessive accumulation. It is strictly prohibited to pour concrete in the middle of the span of the floor slab (temporary support is considered a support at this time). The pump concrete pipeline support should be supported on steel beams.
- 3) When vibrating at construction joints, it is necessary to avoid cracking the initially set concrete.
- 4) During the concrete curing period, there should be no concentrated stacking on the floor slab to prevent affecting the bonding between steel bars and concrete. After pouring and compacting, it is necessary to stop for 1-2 days before proceeding to the next process.

4. Conclusion

With the rapid development of domestic architecture, the application of steel truss floor support plate without support technology in construction is becoming more and more common. In this trend, the design and construction of steel truss floor support plate without support are particularly important.

Acknowledgments

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