

Modular Integrated Construction Connection Structure Between Modules and Its Construction Method

Technical Field

This invention pertains to a building structure and its construction method, specifically to a structure for connecting adjacent walls of neighboring MiC modules and its construction method, suitable for use in Modular Integrated Construction.

Background Technology

In existing Modular Integrated Construction, there is a space for cast in-situ concrete between the adjacent walls of neighboring MiC modules. By fixing and connecting rebars and casting concrete within this space, two neighboring MiC modules can be connected. However, at both ends of this cast in-situ concrete space, due to complex stresses and weaker structures, it is necessary to fix more rebar within the space to enhance the structural load transfer capacity. But, due to the narrow space in the increased rebar space between MiC modules, fixing rebar there is very inconvenient, the construction efficiency is low, more labour is consumed and operation is not easy when compared with fixing rebar on site in traditional cast-in-situ construction.

Content of the Invention

The technical problem this invention aims to solve is to provide a simple and easy-to-implement connection structure and construction method for Modular Integrated Construction.

The technical solution of the invention is as follows: a connection structure for Modular Integrated Construction, including:

1. The first connection wall set on the first MiC module.
2. The second connection wall set on the second MiC module.

The first and second connection walls are adjacent, and there's a cast-in-situ concrete space between them, with a rebar increased space at both ends.

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In the rebar increased space, several series of exposed embedded parts are arranged vertically on the opposite sides of the first and second connection walls. The exposed part of the embedded parts has vertical through holes. The embedded parts on the first connection wall correspond horizontally to the second connection wall and are connected by middle connectors.

The middle connector includes multiple vertically arranged middle connecting pieces and vertical rods fixedly connected to these middle connecting pieces. The middle connecting piece has two connection holes on the left and right, which correspond vertically to the vertical through holes on the embedded parts of the first and second connection walls. They are connected using vertical through connecting rebars passing through these connection holes and vertical through holes.

The embedded parts are steel plates or steel rings partially embedded in the precast wall, and each series of embedded parts is connected by rebars.

The vertical rod passes through the center hole located between the two connection holes on the sides of each middle connecting piece and is welded to the middle connecting piece.

The edge of the connection hole on the side connected to the embedded part of the first connection wall is straight.

The two end faces of the middle connecting piece with connection holes are arc-shaped.

The diameters of the connection holes and vertical through holes are between 22mm and 30mm.

The construction method of the connection structure for Modular Integrated Construction includes the following steps:

Step 1. Lift and fix the first MiC module to the set position.

Step 2. Pass a vertical through connecting rebar through the vertical through hole of the embedded part of the first connection wall and one side of the middle connector, then rotate the middle connector to the side.

Step 3. Lift and fix the second MiC module to the set position.

Step 4. Rotate the middle connector so that one side of the connection hole corresponds vertically to the vertical through hole of the embedded part of the second connection wall, then pass a vertical through connecting rebar through.

Compared with existing technologies, the connection structure and construction method of this invention for Modular Integrated Construction is simple and easy to implement. It uses middle connecting pieces with connection holes on both sides, connected to embedded parts on both sides of the connection wall with vertical through connecting rebars. This design is not affected by narrow spaces, saving labor, reducing construction costs, and increasing efficiency. Additionally, under normal circumstances, the first and second MiC modules are non-structural walls and do not bear structural loads. Only the middle cast-in-situ part bears the structural load. After using this invention's connection structure, the two non-structural walls can also participate in structural load bearing, achieving better overall load-bearing.

Drawings Explanation

Figure 1 is a schematic diagram of the connection between adjacent MiC modules.

Figure 2 is a vertical sectional view of the first connecting wall body 11 in the rebar fixing space.

Figure 3 is a horizontal sectional view of the first connecting wall body 11 in the rebar fixing space.

Figure 4 is a vertical sectional view of the central connector 6 connected to the embedded part 5 of the first connecting wall body 11.

Figure 5 is a horizontal sectional view of the central connector 6 connected to the embedded part 5 of the first connecting wall body 11.

Figure 6 is a vertical sectional view of the central connector 6 when connected to the embedded part 5 of both the first connecting wall body 11 and the second connecting wall body 21.

Figure 7 is a horizontal sectional view of the central connector 6 when connected to the embedded part 5 of both the first connecting wall body 11 and the second connecting wall body 21.

Figure 8 is an elevation view of the central connector 6.

Figure 9 is a plan view of the central connector 6.

Figure 10 is an enlarged view of section A in Figure 6.

Specific Implementation Method

The invention will be further detailed below in combination with examples and attached figures.

As shown in Figures 1, 6, and 7, the connection structure of the Modular Integrated Construction of the present invention includes: adjacent first connecting wall body 11 and second connecting wall body 21, embedded parts 5 fixedly set on the opposite sides of the first and second connecting wall bodies, and a central connector 6 connected to the embedded parts 5 on both sides.

In this embodiment, the first connecting wall body 11 of the first MiC module 1 is set on the left side, the second connecting wall body 21 of the second MiC module 2 is set on the right side, and the first and second connecting wall bodies 11 and 21 are adjacent to each other with a cast-in-situ concrete space 3 in between, which has rebar increased spaces 4 at its both ends.

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The embedded parts 5 and the central connector 6 are set at the rebar increased space 4. As shown in Figures 2 and 3, the first connecting wall body 11 has several rows of embedded parts 5 facing the cast-in-situ concrete space 3, with each row comprising multiple embedded parts 5 spaced vertically. Similarly, the second connecting wall body 21 also has rows of vertically aligned embedded parts 5 facing the cast-in-situ concrete space 3. Moreover, the embedded parts 5 on the first connecting wall body 11 correspond horizontally to those on the second connecting wall body 21 and are connected via the central connector 6.

The embedded part 5 is a steel plate or steel ring partially embedded in the precast wall, with an exposed portion having a vertical through hole 51. Each row of embedded parts 5 embedded in the wall is interconnected with vertical rebars 8, enhancing the binding strength between the embedded parts 5 and the wall. In this embodiment, the embedded parts 5 are roughly rectangular steel plates.

As shown in Figures 8 and 9, the central connector 6 includes: multiple middle connecting plates 61 arranged vertically and a vertical rod 62 fixedly connected to the middle connecting plates 61. The middle connecting plates 61 have two connection holes 63 on the left and right. In this embodiment, the vertical rod 62 passes through a central hole 64 between the two connection holes 63 of each middle connecting plate 61 and is welded to the middle connecting plate 61.

As shown in Figures 7 and 10, the two connection holes 63 on the middle connecting plate 61 correspond vertically to the vertical through holes 51 of the embedded parts 5 on the first connecting wall body 11 and the second connecting wall body 21. They are connected using vertical connecting rebars 7 passing through the connection holes 63 and vertical through holes 51.

Preferably, as shown in Figure 9, the outer edge of the connection hole 63 on the side of the middle connecting plate 61 connected to the embedded part 5 of the first connecting wall body 11 is a straight edge 65. The vertical connecting rebar 7 can slide along this straight edge 65, minimizing errors compared to a curved edge. Moreover, the two sides of the middle

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connecting plate 61 with connection holes 63 have an arcuate shape, facilitating rotation of the middle connecting plate 61 in a narrow space.

The diameters of the connection holes 63 and vertical through holes 51 range from 22mm to 30mm. In this embodiment, they have a diameter of 25mm. The middle connecting plate 61 uses a 12mm steel plate, the connecting rebar 7 uses a through connecting rebar with a diameter of 16mm, and the vertical rod 62 uses a rebar with a diameter of 10mm.

In this embodiment, the construction method of the connection structure of the Modular Integrated Construction of the present invention includes the following steps:

Step 1: As shown in Figures 2 and 3, lift the first MiC module 1 to the set position and fix it. Both ends of its first connecting wall body 11 have exposed embedded parts 5.

Step 2: As shown in Figures 4 and 5, after passing the vertical connecting rebar 7 through the vertical through hole 51 of the embedded part 5 of the first connecting wall body 11 and the connection hole 63 on the left side of the central connector 6, rotate the central connector 6 to one side so that its other side's connection hole 63 is near the first connecting wall body 11.

Step 3: Lift the second MiC module 2 to the set position and fix it.

Step 4: As shown in Figures 6 and 7, after rotating the central connector 6 so that its side's connection hole 63 vertically corresponds to the vertical through hole 51 of the embedded part 5 of the second connecting wall body 21, pass the vertical connecting rebar 7 through this side's connection hole 63 and vertical through hole 51.

The above description is just a preferred embodiment of the present invention and should not be taken as limiting. Any modifications, equivalent replacements, and improvements made within the spirit and principle of the present invention should be included within the scope of this invention.

Claims

1. A connection structure of modular integrated construction (ñMiCò), including: the first connection wall (11) set on the first MiC module (1), and the second connection wall (21) set on the second MiC module (2). The first connection wall (11) and the second connection wall (21) are adjacent and there is a cast-in-situ concrete space (3) between them. The two ends of this space are provided with a steel reinforcement increased space (4). It is characterized by:
At the steel reinforcement increased space (4), the first connection wall (11) and the second connection wall (21) are fixedly provided with several series of exposed embedded parts (5) arranged vertically on the opposite side. The exposed part of the embedded part (5) has a vertical through hole (51). The embedded parts (5) on the first connection wall (11) correspond one by one horizontally with the embedded parts (5) on the second connection wall (21) and are connected through the central connector (6).
The central connector (6) includes: several middle connecting pieces (61) arranged vertically, and the vertical rod (62) fixedly connected to these middle connecting pieces (61). The middle connecting piece (61) has two connecting holes (63) on the left and right, which vertically correspond to the vertical through-holes (51) on the embedded parts (5) of the first connection wall (11) and the second connection wall (21). The vertical through connecting rebar (7) passes through the connecting hole (63) and the vertical through-hole (51) to connect the embedded parts (5) on both sides and the central connector (6) together.
2. The characteristics of the connection structure of modular integrated construction as described in claim 1 are that: the embedded parts (5) are steel plates or steel rings partially embedded in the precast wall, and each series of embedded parts 5 is connected together with rebar.
3. The characteristics of the connection structure of modular integrated construction as described in claim 1 are that: the vertical rod (62) passes through the center hole opened between the two connecting holes (63) of each middle connecting piece (61) and is welded and fixed to the middle connecting piece (61).
4. The characteristics of the connection structure of modular integrated construction as described in claim 1 are that: the edge of the connecting hole (63) on the side of the

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middle connecting piece (61) connected to the embedded part (5) of the first connection wall (11) is a straight edge.

5. The characteristics of the connection structure of modular integrated construction as described in claim 1 are that: the two ends of the middle connecting piece (61) with the connecting hole (63) are arc-shaped.
6. The characteristics of the connection structure of modular integrated construction as described in claim 1 are that: the diameters of the connecting hole (63) and the vertical through-hole (51) are 22mm to 30mm.
7. The characteristics of a construction method for the connection structure of modular integrated construction as described in claim 1 are that it includes the following steps:
Step 1: Hoist the first MiC module (1) to the set position and fix it.
Step 2: After using the vertical through connecting rebar (7) to pass through the vertical through-hole (51) of the embedded part (5) of the first connection wall (11) and the connecting hole (63) on one side of the central connector (6), rotate the central connector (6) to one side so that the other side's connecting hole (63) is close to the first connection wall (11).
Step 3: Hoist the second MiC module (2) to the set position and fix it.
Step 4: Rotate the central connector (6) so that the connecting hole (63) on one side corresponds vertically to the vertical through-hole (51) of the embedded part (5) on the second connection wall (21), and use the vertical through connecting rebar (7) to pass through that side's connecting hole (63) and vertical through-hole (51).