

[DESCRIPTION]

[Invention Title]

WEB CONNECTED TYPE STEEL COMPOSITE CONCRETE BEAM-COLUMN
JOINT STRUCTURE

5 [Technical Field]

The present invention relates to a web connected type steel composite concrete beam-column joint structure that is economical because an end bending moment may be reduced by coupling the webs of steel plate built-up beams, which are
10 disposed on both sides of a column frame member in a beam-column joint part, to a column so that the webs are arranged one after the other, and also has excellent constructability because the beam is easy to install and the arrangement of connecting rebars in the column is minimized.

15 [Background Art]

The steel reinforced concrete structure is to encase columns with reinforced concrete in the normal steel structure and is thus advantageous in terms of cost savings and fire resistance compared to steel structures.

20 One of the most important factors in the steel reinforced concrete structure is the joining of columns and beams. Conventionally, in order to join the beam to the column, it has been common to employ the rigid beam-column connection

method of joining a connecting member to the part where the flange of the beam and a web are joined in the column of the H-beam.

In addition, as shown in Fig. 1, there has been developed an earthquake-proof joint structure for joining a TSC beam to a PSRC column, in which shaped steel members such as L-shaped steel are disposed outside a column and neighboring ones of the shaped steel members are pre-assembled with lateral reinforcing members (Korean Registered Patent No. 10-1233693).

In the registered technique,

In this registered technique, a beam cradle 4 is disposed between adjacent sub shaped steel members 3 of a column in a panel zone, where beams and the column are joined, and a cross-shaped rigid connection beam 2 is arranged on the beam cradle 4.

However, the technique has disadvantages that the installation work of the beam cradle 4 is troublesome and the beam cradle 4 protrudes outside the column, making it difficult to secure the cover thickness of the column member.

Furthermore, it is necessary to arrange a large number of rebars through the column for rigid connection of beam end portions, wherein the rebar arrangement work is troublesome

and it is difficult to perform the concrete pouring work for the column due to rebar interference.

[Disclosure]

[Technical Problem]

5 In order to solve the above problems, the present invention aims to provide a web connected type steel composite concrete beam-column joint structure capable of minimizing the connecting rebar arrangement in the column while maintaining continuity of the column and the beam.

10 The present invention seeks is intended to provide a web connected type steel composite concrete beam-column joint structure, in which a beam can be easily installed on a prefabricated column member in a PSRC structure where a shaped steel member is disposed outside the column.

15 The present invention is intended to provide a web connected type steel composite concrete beam-column joint structure, in which no members protrude outside the prefabricated column in favor of ensuring management and covering thickness.

20 [Technical Solution]

The present invention according to a preferred embodiment relates to a joint structure of a column frame member, which is to be formed as a steel composite concrete column and

includes a plurality of shaped steel members to be provided on the outside of a column, and a steel plate built-up beam, which is to be formed as a steel composite concrete beam with concrete to be poured inside and includes one pair of webs, a lower
5 flange for connecting the lower ends of the one pair of webs, and an upper flange joined to each of the upper ends of the webs, and provides a web connected type steel composite concrete beam-column joint structure, characterized in that the webs of the steel plate built-up beam, which are disposed
10 at both sides of the column frame member, are connected to each other, and the web is joined to one side of the shaped steel members of the column frame member.

The present invention according to another preferred embodiment provides a web connected type steel composite
15 concrete beam-column joint structure characterized in that the web of the steel plate built-up beam comes into close contact with the one side of the shaped steel members and is joined thereto by a plurality of bolts.

The present invention according to still another preferred
20 embodiment provides a web connected type steel composite concrete beam-column joint structure characterized in that the inner surface of the web of the steel plate built-up beam is

joined to the outside of outermost shaped steel members provided at the corners of the column frame member.

The present invention according to still another preferred embodiment provides a web connected type steel composite concrete beam-column joint structure characterized in that the web of the steel plate built-up beam is joined to one side of inner shaped steel members provided between the outermost shaped steel members of the column frame member.

The present invention according to a further preferred embodiment provides a web connected type steel composite concrete beam-column joint structure characterized in that the shaped steel members are L-shaped steel members and the web of the steel plate built-up beam is joined to one side legs of the L-shaped steel members.

[Advantageous Effects]

According to the present invention, the end bending moment may be reduced through semi-rigid connection of beam-column by coupling the webs of the steel plate built-up beams, which are disposed on both sides of a column frame member in a beam-column joint part, to a column so that the webs are arranged one after the other. Accordingly, it is possible to design the bending moment with sufficient strength while maintaining the

sectional size constant over the entire beam length, thereby ensuring economic efficiency.

According to the present invention, the continuity of beam joint may be maintained in the beam-column joint part, the
5 installation and management of beams in the panel zone may be facilitated, and the arrangement of connecting rebars in the column may be minimized, thereby ensuring excellent constructability.

According to the present invention, no members protrude
10 outside the column such that it is advantageous in securing the cover thickness of the column member.

[Description of Drawings]

Fig. 1 is a perspective view showing a beam-column joint part having a prior art beam cradle.

15 Fig. 2 is a perspective view showing a web connected type steel composite concrete beam-column joint structure according to the present invention.

Fig. 3 is a plan view of Fig. 2.

Fig. 4 is a perspective view showing a web-connected type
20 steel composite concrete beam-column joint structure, according to the present invention, which has a steel plate built-up beam joined in two directions.

Fig. 5 is a perspective view showing the coupling relationship between the web of a steel plate built-up beam and the shaped steel member of a column frame member.

Fig. 6 is a plan view showing the web of a steel plate built-up beam joined to the outside of an inner shaped steel member.

Fig. 7 is a plan view showing the web of a steel plate built-up beam joined to the inside of an inner shaped steel member.

Fig. 8 is a plan view showing the coupling relationship between a steel plate built-up beam and the shaped steel member of a column frame member.

[Best Mode for Carrying out the Disclosure]

A web connected type steel composite concrete beam-column joint structure, according to the present invention, relates to a joint structure of a column frame member, which is to be formed as a steel composite concrete column and includes a plurality of shaped steel members to be provided on the outside of a column, and a steel plate built-up beam, which is to be formed as a steel composite concrete beam with concrete to be poured inside and includes one pair of webs, a lower flange for connecting the lower ends of the one pair of webs, and an upper flange joined to each of the upper ends of the webs, and

is characterized in that the webs of the steel plate built-up beam, which are disposed at both sides of the column frame member, are connected to each other, and the web is joined to one side of the shaped steel members of the column frame member.

5 [Mode for Carrying out the Disclosure]

Hereinafter, the present invention will be described with reference to the accompanying drawings and preferred embodiments.

Fig. 2 is a perspective view showing a web connected type steel composite concrete beam-column joint structure according to the present invention, and Fig. 3 is a plan view of Fig. 2. In addition, Fig. 4 is a perspective view showing a web-connected type steel composite concrete beam-column joint structure, according to the present invention, which has a steel plate built-up beam joined in two directions.

As shown in Fig. 2 to Fig. 4, a web connected type steel composite concrete beam-column joint structure, according to the present invention, relates to a joint structure of a column frame member 1, which is to be formed as a steel composite concrete column and includes a plurality of shaped steel members 11, 12 to be provided on the outside of a column, and a steel plate built-up beam 2, which is to be formed as a steel composite concrete beam with concrete to be poured inside and

includes one pair of webs 21, a lower flange 22 for connecting the lower ends of the one pair of webs 21, and an upper flange 23 joined to each of the upper ends of the webs 21, and is characterized in that the webs 21 of the steel plate built-up beam 2, which are disposed at both sides of the column frame member 1, are connected to each other, and the web 21 is joined to one side of the shaped steel members 11, 12 of the column frame member 1.

The column frame member 1 includes the plurality of shaped steel members 11, 12 to be disposed on the outside of a column so as to form a steel composite concrete column together with the concrete poured inside and outside.

The column frame member 1 may be formed as a prefabricated steel reinforced concrete column PSRC by prefabricating a plurality of shaped steel members 11, 12 and lateral reinforcing members 13 for connecting neighboring ones of the shaped steel members 11, 12 in a factory, and transporting and constructing the same on site (Korean Patent No. 10-1050956).

L-shaped steel can be used as such shaped steel members 11, 12 and T-shaped steel, channels, H-shaped steel and the like are also available.

The steel plate built-up beam 2 is to form a steel composite concrete beam with concrete poured thereinto and

includes one pair of webs 21, a lower flange 22 for connecting the lower ends of the one pair of webs 21, and upper flanges 23 coupled to the upper ends of the webs 21, respectively.

Herein, the steel plate built-up beam 2 disposed on both sides of the column frame member 1 has the webs 21 connected to each other, and the web 21 is coupled to one side of the shaped steel members 11, 12 of the column frame member 1.

To this end, the steel plate built-up beam 2 disposed on both sides of the column frame member 1 is fabricated such that the webs 21 are connected, wherein the upper and lower flanges 22, 23 can be formed to be cut at portions corresponding to the column frame member 1 such that the column frame member 1 can penetrate the same.

As shown in Fig. 2 or Fig. 4, it is possible to prefabricate the steel plate built-up beam 2 into a bracket shape by joining the end portion of the steel plate built-up beam 2 to the shaped steel members 11, 12 of the column frame member 1 by a predetermined length in advance at the factory. In addition, an intermediate beam between neighboring column frame members 1 can be fabricated in the order of field assembly.

If the webs 21 of the steel plate built-up beams 2 located on both sides of the column are directly joined to the inside or outside of the shaped steel members 11, 12 of the column

frame member 1 so as to be arranged one after the other, the beams can be easily joined to the column frame member 1 in the beam-column joint part. In addition, since the beam webs 21 on both sides of the column are continuous, connecting rebars arrangement in the column can be minimized.

In addition, since there is no metal protruding outside the column frame member 1 for beam connection, the management may be facilitated and the cover thickness of the column frame member 1 may be secured without involving difficulty.

10 In addition, since the steel composite concrete beam penetrates the column only through the webs 21 and the upper and lower flanges 22, 23 are cut at the portions corresponding to the column, the beam end condition is in a semi-rigid connection state. In the case of rigid connection, the negative moment of the end of the beam becomes twice the positive moment of the center of the beam, resulting in the decrease of the cross-sectional efficiency. To the contrast, according to the present invention, the end bending moment of the beam can be reduced by the semi-rigid connection. Therefore, it is possible to have a sufficient internal force against the bending moment caused in each part of the beam while uniformly maintaining the cross-sectional size of the whole beam, thereby enabling economical and rational design.

According to the embodiments shown in Fig. 2 and Fig. 3, the shaped steel members 11 are disposed such that each leg faces the outside of the column, and the webs 21 of the steel plate built-up beam 2 are joined to the outside of one side
5 leg of the shaped steel members 11.

Referring to Fig. 4, if the steel plate built-up beams 2, 2' are arranged in two directions, that is, if beams are joined to four surfaces of a column, the webs 21, 21' of the steel plate built-up beams 2, 2' are joined to the shaped steel
10 members 11 so as to form a cross shape in a plan view.

Herein, the webs 21 of the beam disposed in one direction may be formed such that the both side webs 21 of the column frame member 1 are connected to each other, and the other beam disposed to be perpendicular to the beam disposed in one
15 direction may be cut in the webs 21' so as to be joined to the inside and outside of the webs 21 of the beam disposed in one direction by welding or the like.

The webs 21 of the steel plate built-up beam 2 may be formed such that the inner surfaces of the webs 21 are joined
20 to the outside of the outermost shaped steel members 11 provided at the corners of the column frame member 1.

In the case where the width of the steel plate built-up beam 2 is equal to the interval between the outermost shaped

steel members 11 of the column frame member 1 or the like, the webs 21 may be directly joined to the outside of the outermost shaped steel members 11.

Fig. 5 is a perspective view showing the coupling relationship between the web of a steel plate built-up beam and the shaped steel member of a column frame member.

As shown in Fig. 5 and the like, the webs 21 of the steel plate built-up beam 2 may be in close contact with one side of the shaped steel members 11, 12 and joined to the shaped steel members 11, 12 by means of a plurality of bolts 3.

If the webs 21 of the steel plate built-up beam 2 are fastened by bolts 3 to the shaped steel members 11, 12 of the column frame member 1, the site welding process can be omitted such that the construction is safe and convenient.

In the joint part, the steel plate built-up beam 2 is supported on the column frame member 1 by the shear of the bolts 3.

The bolts 3 may be fastened in a plurality of rows according to the magnitude of the stress to be transmitted.

Fig. 6 is a plan view showing the web of a steel plate built-up beam joined to the outside of an inner shaped steel member, and Fig. 7 is a plan view showing the web of a steel

plate built-up beam joined to the inside of an inner shaped steel member.

As shown in Fig. 6 and Fig. 7, the webs 21 of the steel plate built-up beam 2 may be joined to one side of the inner shaped steel members 12 provided between the outermost shaped steel members 11 of the column frame member 1.

That is, the webs 21, 21' of the steel plate built-up beams 2, 2' may be joined to the outside of the inner shaped steel members 12, as shown in Fig. 6, or to the inside of the inner shaped steel members 12, as shown in Fig. 7.

In the case where the width of the steel plate built-up beam 2 is smaller than the width of the column frame member 1, that is, the width between the outermost shaped steel members 11,

the webs 21, 21' of the steel plate built-up beams 2, 2' may be joined to the inner shaped steel members 12 of the column frame member 1.

The positions of the inner shaped steel members 12 may be adjusted according to the width of the steel plate built-up beams 2, 2'.

The webs 21, 21' may be joined by bringing the inside or the outside of the webs 21, 21' into close contact with the inner shaped steel members 12 according to the width of the

inner shaped steel members 12 or the width of the steel plate built-up beams 2, 2'.

The embodiment shown in Fig. 6 has an advantage in that the width of the steel plate built-up beams 2, 2' may be formed wider, and the embodiment shown in Fig. 7 has an advantage in that the steel plate built-up beams 2, 2' may be inserted between the inner shaped steel members 12, thereby facilitating fabrication.

Fig. 8 is a plan view showing the coupling relationship between a steel plate built-up beam and the shaped steel member of a column frame member.

As shown in Fig. 8b, it is possible to form the shaped steel members 11, 12 with L-shaped steel and join the webs 21 of the steel plate built-up beam 2 to one side legs of the L-shaped steel.

As shown in Fig. 8a, in the case where the flanges of the steel plate built-up beam 2 are directly fixed to the shaped steel members 11, 12 that are the L-shaped steel, the legs of the L-shaped steel may be applied with the out-of-plane force acting by the moment of the steel composite concrete beam and thus there is a concern about buckling.

Therefore, according to the present invention, the webs 21 of the steel plate built-up beam 2 are fixed to the side

surfaces of one side legs of the shaped steel members 11, 12, which are L-shaped steel, such that force acts in the in-plane direction of the one side legs of the shaped steel members 11, 12. As a result, the buckling risk of the shaped steel members 11, 12 may be greatly reduced when a moment is generated in the steel composite concrete beam.

[Industrial Applicability]

The present invention relates to a web connected type steel composite concrete beam-column joint structure, in which the webs of the steel plate built-up beams, which are disposed on both sides of a column frame member in the beam-column joint part, are joined to a column so that the webs are arranged one after the other, may reduce the end bending moment through the semi-rigid connection of beam-column, thereby improving economic efficiency, and is industrially applicable in that the installation and management of the beams in the panel zone is facilitated.

[CLAIMS]

[Claim 1]

In a joint structure of a column frame member (1), which is to be formed as a steel composite concrete column and includes a plurality of shaped steel members (11, 12) to be provided on the outside of a column, and a steel plate built-up beam (2), which is to be formed as a steel composite concrete beam with concrete to be poured inside and includes one pair of webs (21), a lower flange (22) for connecting the lower ends of the one pair of webs (21), and an upper flange (23) joined to each of the upper ends of the webs (21),

a web connected type steel composite concrete beam-column joint structure, characterized in that

the webs (21) of the steel plate built-up beam (2), which are disposed at both sides of the column frame member (1), are connected to each other, and the web (21) is joined to one side of the shaped steel members (11, 12) of the column frame member (1).

20 [Claim 2]

A web connected type steel composite concrete beam-column joint structure according to claim 1, wherein the web (21) of the steel plate built-up beam (2) comes into close contact with

the one side of the shaped steel members (11, 12) and is joined thereto by a plurality of bolts (3).

[Claim 3]

5 A web connected type steel composite concrete beam-column joint structure according to claim 1, wherein the inner surface of the web (21) of the steel plate built-up beam (2) is joined to the outside of outermost shaped steel members (11) provided at the corners of the column frame member (1).

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[Claim 4]

 A web connected type steel composite concrete beam-column joint structure according to claim 1, wherein the web (21) of the steel plate built-up beam (2) is joined to one side of
15 inner shaped steel members (12) provided between the outermost shaped steel members (11) of the column frame member (1).

[Claim 5]

 A web connected type steel composite concrete beam-column
20 joint structure according to any one of claims 1 to 4, wherein the shaped steel members (11, 12) are L-shaped steel members and the web (21) of the steel plate built-up beam (2) is joined to one side legs of the L-shaped steel members.