

[DESCRIPTION]

[Invention Title]

5 **MEGA COLUMN AND CONSTRUCTION METHOD THEREFOR**

[Technical Field]

10 The present invention relates to a mega column having a large cross-sectional size and a high height and a construction method thereof and, more particularly, to a mega column and a construction method thereof, in which four prefabricated column units are arranged to be spaced apart from each other on the four corners of the mega column so that space parts are formed between the neighboring ones of the
15 prefabricated column units and concrete is poured therein.

[Background Art]

20 In the case of a mega column with a member cross-sectional size of about 3 m or more, when the column is made of RC, the amount of rebars is excessive and it is difficult for workers to work inside the column.

25 In particular, since the reinforcing bars are required to be arranged very tightly along the section of the column and the reinforcing bars such as hoops are required to be very long, the reinforcement placing work becomes hard and it is difficult for workers to come out of the column, after
30 completing the reinforcement placing work in the column, due to the interference between main bars and the hoops.

 In addition, since the mega column has a height of more than 20 m, it is necessary to install scaffoldings during the

installation and removal work of forms. Besides, since the reinforcement or formwork has to be carried out at high altitude, there is a great risk of safety accidents.

5 Furthermore, since the form area is wide, it takes much time to install the form, resulting in the construction delay. In addition, it is necessary to support the form by installing an external support on the outside of the form in response to the lateral pressure of concrete, wherein since the size of
10 the member itself is large, it is very difficult to install temporary supports.

 Due to the difficulties of various field work, it is possible to consider forming such a mega column from PC
15 members. However, when the mega column is made from PC members, the weight and size of the member are too large and thus it is practically impossible to transport or lift the same.

 In addition, even in the case of designing a general SRC
20 system, with respect to the mega column, it is also difficult to carry out the reinforcement placing work of reinforcing bars such as hoops, and it is still difficult for a worker to move between reinforced steel bars. Besides, the installation or removal work of forms has to be carried out in the field
25 such that the problems of the RC as mentioned above still remain.

 Accordingly, prior art patent No. 10-2012-0012916 discloses a technique for a steel pipe with increased rigidity,
30 capable of forming a large column with CFT columns.

 However, this technique still has problems that the technique is difficult to be applied to a very large column

because of the limit of the size of a steel pipe that can be manufactured, it is difficult to install a main beam in a CFT column and it is difficult to process a column-base joint, a column junction or a column-beam junction.

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[Disclosure]

[Technical Problem]

10 Accordingly, the present invention has been made in an effort to solve the above-mentioned problems and disadvantages occurring in the prior arts, and the present invention aims to provide a mega column and a construction method thereof, in which field reinforcement work can be minimized as well as the
15 installation and dismantling work thereof can be omitted through the use of factory prefabricated column units, thereby reducing a construction time.

 The present invention intends to provide a mega column
20 and a construction method thereof, in which a worker can enter the inside of the column to perform various necessary work such as reinforcement placing.

 The present invention provides a mega column and a
25 construction method thereof, in which no external temporary support is additionally required and the burden of safety accidents due to high place work can be reduced.

 The present invention intends to provide a mega column
30 and a construction method thereof, which can minimize the burden of transporting and lifting.

The present invention intends to provide a mega column and a construction method thereof, in which columns of various sizes can be made while using standardized column units.

5 [Technical Solution]

According to a preferred embodiment of the present invention, the present invention relates to a mega column configured by assembling four prefabricated column units and
10 pouring concrete therein, and provides a mega column, characterized in that each of the prefabricated column units includes a plurality of main shape steel members, first lattice members for interconnecting neighboring ones of the main shape steel members, which form the outer surfaces of the
15 mega column, second lattice members for interconnecting neighboring ones of the main shape steel members, which form surfaces positioned inside, and a first form coupled to the outer surfaces of the first lattice members, wherein the respective prefabricated column units are arranged on the four
20 corners of the mega column to be spaced apart from one another, thereby forming space parts between the neighboring ones of the prefabricated column units such that the neighboring main shape steel members on the outside of the neighboring prefabricated column units, are interconnected by third
25 lattice member and the neighboring main shape steel members on the inside of the neighboring prefabricated column units are interconnected by fourth lattice members, and second forms are coupled to the outside of the third lattice members.

30 According to another preferred embodiment of the present invention, there is provided the mega column, characterized in that the prefabricated column units respectively include first form ties coupled between one side of the first lattice

members and the main shape steel members positioned on the inner corners.

According to a still another preferred embodiment of the present invention, there is provided the mega column, characterized in that the prefabricated column units respectively include second form ties coupled on the outer corners so as to interconnect one side of the neighboring ones of the first lattice members.

According to yet another preferred embodiment of the present invention, there is provided the mega column, characterized in that a plurality of vertical reinforcements are laid on the surfaces of the prefabricated column units), which form the outer surfaces of the mega column.

According to a further preferred embodiment of the present invention, there is provided the mega column, characterized in that the vertical reinforcement is coupled to U-shaped reinforcements, of which end portions face the inside of the prefabricated column units.

According to a still further preferred embodiment of the present invention, there is provided the mega column, characterized in that the first lattice members and third lattice members are to be z-bars.

According to another preferred embodiment of the present invention, there is provided the mega column, characterized in that the first forms and second forms are to be rib deck forms, in which ribs and flanges are alternately formed, and arranged such that the longitudinal direction thereof is to be the vertical direction.

In addition, according to still another preferred embodiment of the present invention, the present invention relates to a method for constructing a mega column and provides a mega column construction method, comprising: (a) the step of providing four prefabricated column units on the four corners of a mega column such that the four prefabricated column units are spaced apart from each other so as to form space parts therebetween; (b) the step of connecting the prefabricated column units, which neighbor each other on three surfaces of the mega column, with third lattice members and attaching second forms thereto; (c) the step of interconnecting the inner corners of the neighboring prefabricated column units with fourth lattice members; (d) the step of connecting the prefabricated column units, which neighbor each other on the remaining one surface of the mega column, with third lattice members and attaching second forms thereto; and (e) the step for pouring concrete to the inside of the prefabricated column units and the space parts.

According to another preferred embodiment of the present invention, there is provided the mega column construction method, characterized in that, in step (b) and step (d), the second forms and the third lattice members are preliminarily coupled together and then attached to main shape steel members of the prefabricated column units.

[Advantageous Effects]

As described hereinabove, the present invention has following effects.

First, since the prefabricated column units are used, in which the forms are coupled to the steel frame arranged on the outside of the column, the field reinforcement work can be minimized and there is no need for external temporary support.

5 Further, the form installation work can be omitted and the forms combined on the prefabricated column units can be used as permanent forms.

10 Secondly, since the prefabricated column units are manufactured at the factory and then brought in the field, it is possible to shorten the work period by minimizing the field work and reduce the risk of safety accidents due to the high place work.

15 Third, since the mega column is divided into the four prefabricated column units in the factory and the concrete is poured on the site such that the burden of the transporting and lifting is minimized.

20 Fourth, the space part is formed between the neighboring ones of the prefabricated column units, such that an entry and exit path can be secured that allows the workers to enter the inside of the column and perform various necessary works.

25 Fifth, it is possible to manufacture a variety of standard columns while using standardized column units, by adjusting the size of the space part.

[Description of Drawings]

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Fig. 1 is a perspective view of a mega column according to the present invention.

Fig. 2 is a cross-sectional view of a prefabricated column unit.

Fig. 3 is a perspective view of a part of the prefabricated column unit.

5 Fig. 4 is a perspective view of the prefabricated column unit.

Fig. 5 is a cross-sectional view of the mega column according to the present invention.

10 Fig. 6 is a cross-sectional view for showing the change of size of the mega column according to the width adjustment of space parts, and

Fig. 7 is a perspective view for showing a stepwise process of a mega column construction method according to the present invention.

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[Best Mode for Carrying out the Invention]

In order to achieve the above-mentioned objectives of the present invention, a mega column according to the present invention is configured by assembling four prefabricated column units and pouring concrete therein, and characterized in that each of the prefabricated column units includes a plurality of main shape steel members, first lattice members for interconnecting neighboring ones of the main shape steel members, which form the outer surfaces of the mega column, second lattice members for interconnecting neighboring ones of the main shape steel members, which form surfaces positioned inside, and a first form coupled to the outer surfaces of the first lattice members, wherein the respective prefabricated column units are arranged on the four corners of the mega column to be spaced apart from one another, thereby forming space parts between the neighboring ones of the prefabricated column units such that the neighboring main shape steel

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members on the outside of the neighboring prefabricated column units, are interconnected by third lattice member and the neighboring main shape steel members on the inside of the neighboring prefabricated column units are interconnected by fourth lattice members, and second forms are coupled to the outside of the third lattice members.

[Mode for Invention]

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

Fig. 1 is a perspective view of a mega column according to the present invention, Fig. 2 is a cross-sectional view of a prefabricated column unit, and Fig. 3 is a perspective view of a part of the prefabricated column unit.

Furthermore, Fig. 4 is a perspective view of the prefabricated column unit, Fig. 5 is a cross-sectional view of the mega column according to the present invention, and Fig. 6 is a cross-sectional view for showing the change of size of the mega column according to the width adjustment of space parts.

As shown in Fig. 1, Fig. 2, Fig. 5 and the like, a mega column according to the present invention is manufactured by assembling four prefabricated column units 1 and pouring concrete therein, and characterized in that each of the prefabricated column units 1 includes a plurality of main shape steel members 11, first lattice members 12 for interconnecting neighboring ones of the main shape steel members 11, which form the outer surfaces of the mega column,

second lattice members 13 for interconnecting neighboring ones of the main shape steel members 11, which form surfaces positioned inside, and a first form 14 coupled to the outer surfaces of the first lattice members 12, wherein the
5 respective prefabricated column units are arranged on the four corners of the mega column to be spaced apart from one another, thereby forming space parts 2 between the neighboring ones of the prefabricated column units 1 such that the neighboring main shape steel members 11 on the outside of the neighboring
10 prefabricated column units 1, are interconnected by third lattice member 21 and the neighboring main shape steel members 11 on the inside of the neighboring prefabricated column units 1 are interconnected by fourth lattice members 22, and second forms 23 are coupled to the outside of the third lattice
15 members 21.

The mega column according to the present invention is intended to be used as a column member by combining a steel material and concrete, and particularly applicable to a very
20 large column having a member cross-sectional size of about 3 m or more or a high height.

As shown in Fig. 2 and Fig. 3, the prefabricated column unit 1 includes the main shape steel member 11, the first
25 lattice member 12, the second lattice member 13 and the first form 14.

The prefabricated column unit 1 is prepared as a preassembled state in a factory so as to be transferred to the
30 field, reducing the construction time. In addition, a plurality of main shape steel members 11 are used, enabling the reduction of the amount of reinforcement, minimization of

the reinforcement placing work and the like as well as the reduction of the burden of high place work on workers.

The main shape steel members 11 are arranged on each corner of the prefabricated column unit 1, wherein it is possible to use L-shaped section steels and arrange the L-shaped section steels such that the corners of the L-shaped section steels face the inside or outside, as shown in Fig. 2.

Herein, a plurality of vertical reinforcements 17 can be additionally placed, besides the main shape steel members 11, on the surfaces of the prefabricated column unit 1, which form the outer surfaces of the mega column, so as to reinforce a vertical load.

Meanwhile, when the column is subjected to compressive force in the concrete column, an auxiliary reinforcing bar such as a hoop is required corresponding to the concrete expansion in the lateral direction. However, the mega column has a large columnar section and thus it is impossible to install a hoop across the member section. Therefore, a U-shaped reinforcement 18 with an end portion facing the inside of the prefabricated column unit 1 can be coupled to the inside of the vertical reinforcement 17.

When the U-shaped reinforcement 18 is installed outside the column as an auxiliary reinforcing bar and the length of the leg portions of the U-shaped reinforcement 18 is formed to be equal to or greater than an anchoring length, the leg portions of the U-shaped reinforcement 18 are anchored in the concrete and applied with sufficient tension, thereby serving as the hoop.

The first lattice member 12 interconnects neighboring ones of the main shape steel members 11, which form the outer surfaces of the mega column, and the second lattice member 13 interconnects neighboring ones of the main shape steel members 11, which form the surfaces positioned inside.

The first and second lattice members 12 and 13 may be joined to the main shape steel members 11 by fastening members such as bolts such that both ends of the first and second lattice members 12 and 13 are located on the inside or outside of the main shape steel members 11, respectively.

The fastening member may also serve as a shear connection member used for the purpose of transmitting the shearing force of the concrete to the steel and preventing the segregation of the concrete and the steel.

The first and second lattice members 12 and 13 increase the rigidity of the prefabricated column unit 1, thus helping to minimize the deformation of the prefabricated column unit 1 during the transportation and installation thereof.

In the embodiment of Fig. 3 and the like, the first and second lattice members 12 and 13 are connected in the form of horizontal members having the same height at both ends thereof, but it is also possible to arrange the both ends of the first and second lattice members 12 and 13 at different height positions such that the first and second lattice members 12 and 13 are coupled in the form of oblique members to the main shape steel members 11.

Steels of various cross-sectional shapes, such as flat bars, L-shaped steels, channel steels and the like can be used for the first and second lattice members 12 and 13.

5 The first form 14 is bonded to the outer surfaces of the first lattice members 12 attached to the faces of the prefabricated column unit 1, which form the outer surfaces of the mega column.

10 Since the first form 14 is attached in advance in the factory, it is possible to omit the field formwork and utilize the first form 14 as a permanent form.

15 In order to ensure sufficient space for attaching the second form 23 to the outside of the neighboring ones of the prefabricated column units 1 at a later time, as shown in Fig. 2, the first forms 14 are installed only at a predetermined distance from the main shape steel members 11 arranged at the corners of the prefabricated column units 1.

20 As shown in Fig. 2, Fig. 3 and the like, the prefabricated column units 1 can be coupled with first form ties 15 between one side of the first lattice members 12 and the main shape steel member 11 located on an inner corner.

25 Furthermore, the prefabricated column units 1 can be coupled with second form ties 16 on an outer corner so as to interconnect one side of the neighboring ones of the first lattice members 12.

30 The first form ties 15 and the second form ties 16 support the first forms 14 for the lateral pressure during concrete pouring, respectively.

The first form tie 15 can be joined to the first lattice member 12 at one end and bolted to a triangular gusset plate coupled to the inside of the main shape steel member 11, which is an L-shaped steel, at the other end.

In addition, the both ends of the second form tie 16 can be bolt-coupled to the first lattice member 12, respectively.

In this case, it is preferable that the first lattice member 12 is made of a channel steel or a z-bar so that the end portion of the first form tie 15 or the second form tie 16 can be bolt-coupled to the first lattice member 12.

According to the present invention, unit prefabricated column units with a predetermined lengths in the vertical direction are prepared as shown in Fig. 3, and then the unit prefabricated column units can be connected to each other in the vertical direction so as to form the prefabricated column units 1 with high height as shown in Fig. 4.

In this case, the vertical reinforcements 17 of the lower column and the upper column can be joined to each other by a connection plate 19. That is, the vertical reinforcements 17 of the upper and lower columns can be joined to each other by welding the end portions of the vertical reinforcements 17 of the upper and lower columns to the connection plate 19, without overlapping the vertical reinforcement 17 of the lower column and the upper column.

Therefore, there is no need for securing a separate connection length for the vertical reinforcements 17, and the

vertical reinforcements 17 are cut at a column height without extension beyond the upper portion of the column.

As shown in Fig. 1, Fig. 5 and the like, each of the prefabricated column units 1 is arranged to be spaced apart from each other in the four corners of the mega column so as to form space parts 2 between the neighboring ones of the prefabricated column units 1.

These space parts 2 ensure the paths of workers, so that the workers can perform various necessary work in the column.

That is, it is possible for the workers to smoothly carry out, in the column, the work of coupling a prefabricated column unit 1 to a base or a lower prefabricated column unit 1, connecting a neighboring main shape steel member 11 inside the prefabricated column unit 1 to a fourth lattice member 22, and the like.

Besides, as shown in Fig. 6(a) and 6(b), the cross-sectional size of the mega column can be adjusted by adjusting the width of the space part 2. Therefore, it is possible to adjust the size of the mega column while using standardized prefabricated column units 1.

It is also possible to install prefabricated auxiliary column units between the neighboring ones of the prefabricated column units 1.

In addition, the outer neighboring main shape steel members 11 of the neighboring ones of the prefabricated column units 1 are interconnected by the third lattice members 21, and the inner neighboring main shape steel members 11 of the neighboring prefabricated column units 1 are interconnected by

the fourth lattice members 22, wherein the second forms 23 are coupled to the outside of the third lattice members 21.

5 The coupling of neighboring prefabricated column units 1 can be carried out in the field and the second form 23 can be formed as an on-site attachment permanent form.

10 Attachment of the third lattice member 21 is carried out inside or outside the mega column, and the attachment of the fourth lattice member 22 is carried out in the space part 2 formed inside the mega column.

15 The third and fourth lattice members 21 and 22 can be joined to the main shape steel members 11 by fastening members such as bolts such that the both ends thereof are located on the inside or outside of the corresponding main shape steel members 11, respectively.

20 Steels of various cross-sectional shapes, such as flat bars, L-shaped steels, channel steels and the like can be used for the third and fourth lattice members 21, 22.

25 According to the present invention, It is possible that the first lattice members 12 and third lattice members 21, which are provided on one surfaces of the mega column, can be made from z-bars.

30 The mega column should support the lateral pressure of the concrete by all of the first and third lattice members 12 and 21 and the first and second forms 14 and 23. Therefore, first and third lattice members 12 and 21 are made of the z-bars of high stiffness so as to support the lateral pressure of the concrete.

In addition, when the first and third lattice members 12 and 21 are formed of such z-bars, it is advantageous to maintain the coating thickness of the member.

5 As shown in Fig. 1, the first form 14 and the second form are to be rib deck forms, in which ribs and flanges are alternately formed, and arranged such that the longitudinal direction of the ribs and flanges is to be in accordance with the lengthwise direction of the column.

10 The mega column has a wide form area and thus the weight of the forms cannot be ignored when using regular forms. Therefore, the weight of the forms is reduced using the rib deck form, which can be used as a lightweight permanent form.

15 The rib deck form is strong in out-of-plane rigidity and can withstand the weight of liquid concrete before the curing thereof as well as construction loads, thereby sufficiently support the lateral pressure of the concrete.

20 The rib deck form may be coupled to the first and third lattice members 12, 21 by any one of direct-coupling screw, spot welding, pop rivets, or screws.

25 Fig. 7 is a perspective view for showing a stepwise process of a mega column construction method according to the present invention.

30 A method for constructing the mega column of the present invention, which has been described with reference to Fig. 1 to Fig. 6, is shown in Fig. 7(a) to 7(d).

The mega column of the present invention may be manufactured by preparing, in the factory, each of the prefabricated column units 1, which are long in the vertical lengthwise direction as shown in Fig. 4, and transferring four
5 of them to the field such that the four prefabricated column units 1 are coupled with each other. However, Hereafter, the mega column construction method will be described with reference to Fig. 7 with respect to a part of the prefabricated column units 1 having a uniform vertical
10 length for the sake of convenience.

According to the mega column construction method according to the present invention, four prefabricated column units 1 are separated from each other and installed in four
15 corners of a mega column such that the space parts 2 are formed therebetween (Fig. 7(a)).

The prefabricated column units 1 can be fabricated using only mechanical bolt joints in the factory without using
20 welding joints.

The prefabricated column units 1 are transferred to the field site as being coupled to the first forms 14, wherein the first forms 14 can be used as permanent forms.
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Then, in step b, the prefabricated column units 1, which neighbor each other on three surfaces of the mega column, are connected to each other with third lattice members 21 and the second forms 23 are attached thereto (Fig. 7(b)).
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The other one surface of the mega column any other than the three surfaces of the mega column, to which the third lattice members 21 and the second forms 23 attached, is used

as an access path for workers to enter the space parts 2 inside the column and perform various necessary works such as the attachment work of the fourth lattice members 22, and the like.

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Next, in step c, the inner corners of the neighboring prefabricated column units 1 are interconnected with the fourth lattice members 22 (Fig. 7(c)).

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The fourth lattice members 22 interconnect the main shape steel members 11 of the respective prefabricated column units 1 so as to interconnect the inner corners of the neighboring prefabricated column units 1.

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After that, in step d, the prefabricated column units 1, which neighbor each other on the remaining one surface of the mega column, with third lattice members 21 and the second forms 23 are attached thereto (Fig. 7(d)).

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The step d shown in Fig. 7(d) can be carried out inside or outside the mega column.

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Therefore, the worker who entered the space part 2 for the construction work of step c can perform step d outside the mega column after coming out of the space part 2, or the worker who entered the space part 2 in step c can perform step d inside the mega column by attaching the third lattice members 21 and the second forms 23 to the other one surface of the mega column in the space part 2.

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In the latter case, the worker can go up a ladder after step d, and go out of the column or proceed the construction of the upper column successively.

After completing frame of the mega column through steps a to d, as shown in Fig. 1, the form band 3 is attached to the outside of the mega column by using a metal bar and the like, thereby supporting the lateral pressure of the concrete.

Lastly, the concrete is poured and cured inside the prefabricated column units 1 and space parts 2, finishing the construction.

In step b and step d, the second forms 23 and the third lattice members 21 may be bonded together in advance and then attached to the main shape steel members 11 of the prefabricated column units 1.

In this case, the third lattice members 21 and the second forms 23 can be bonded together in advance in the factory and then transferred to the field, thereby simplifying the construction through the reduction of burden of the work on the site.

[Industrial Applicability]

The mega column according to the present invention is industrially applicable in that the prefabricated column units are used such that the field reinforcement placing work as well as the form installation and dismantling work can be omitted, reducing the construction time, no temporary support is required to be provided on the outside, and the burden of safety accidents caused by the high place work can be reduced.

[CLAIMS]

[Claim 1]

A mega column, into which four prefabricated column units
5 are assembled and concrete is poured therein, characterized in
that

each of the prefabricated column units includes
a plurality of main shape steel members,

first lattice members for interconnecting neighboring
10 ones of the main shape steel members, which form the outer
surfaces of the mega column,

second lattice members for interconnecting neighboring
ones of the main shape steel members, which form surfaces
positioned inside, and

15 a first form coupled to the outer surfaces of the first
lattice members,

wherein the respective prefabricated column units are
arranged on the four corners of the mega column to be spaced
apart from one another, thereby forming space parts between
20 the neighboring ones of the prefabricated column units such
that the neighboring main shape steel members on the outside
of the neighboring prefabricated column units, are
interconnected by third lattice member and the neighboring
main shape steel members on the inside of the neighboring
25 prefabricated column units are interconnected by fourth
lattice members, and

second forms are coupled to the outside of the third
lattice members.

30 [Claim 2]

The mega column according to claim 1, wherein the
prefabricated column units respectively include first form

ties coupled between one side of the first lattice members and the main shape steel members positioned on the inner corners.

[Claim 3]

5 The mega column according to claim 1, wherein the prefabricated column units respectively include second form ties coupled on the outer corners so as to interconnect one side of the neighboring ones of the first lattice members.

10 [Claim 4]

 The mega column according to claim 1, wherein a plurality of vertical reinforcements are laid on the surfaces of the prefabricated column units, which form the outer surfaces of the mega column.

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[Claim 5]

 The mega column according to claim 4, wherein the vertical reinforcement is coupled to U-shaped reinforcements, of which end portions face the inside of the prefabricated
20 column units.

[Claim 6]

 The mega column according to claim 1, wherein the first lattice members and third lattice members are to be z-bars.

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[Claim 7]

 The mega column according to claim 6, wherein the first forms and second forms are to be rib decks, in which ribs and flanges are alternately formed, and arranged such that the
30 longitudinal direction thereof is to be the vertical direction.

[Claim 8]

A mega column construction method for constructing the mega column according to any one of claims 1 to 7, comprising:

(a) the step of providing four prefabricated column units on the four corners of a mega column such that the four prefabricated column units are spaced apart from each other so as to form space parts therebetween;

(b) the step of connecting the prefabricated column units, which neighbor each other on three surfaces of the mega column, with third lattice members and attaching second forms thereto;

(c) the step of interconnecting the inner corners of the neighboring prefabricated column units with fourth lattice members;

(d) the step of connecting the prefabricated column units, which neighbor each other on the remaining one surface of the mega column, with third lattice members and attaching second forms thereto; and

(e) the step for pouring concrete to the inside of the prefabricated column units and the space parts.

[Claim 9]

The mega column construction method according to claim 8, wherein, in step (b) and step (d), the second forms and the third lattice members are preliminarily coupled together and then attached to main shape steel members of the prefabricated column units.