

STEEL STRUCTURE FOR REINFORCED CONCRETE WALL PANEL AND METHOD THEREOF

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of Taiwan Patent Application No. 102117655, filed on May 17, 2013, in the Taiwan Intellectual Property Office, the disclosure of which is incorporated herein its entirety by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The following description relates to a steel structure for reinforced concrete wall panel and method thereof, in particular with respect to steel structure, extended steel structure, corner shape steel structure and partition type steel structure for reinforced concrete wall panel.

2. Description of the Related Art

[0003] Most publics have requirements for house safety in terms of shock resistance, however, the seismic intensity for buildings is determined by the primary steel structure with reinforced concrete wall panel and column, and as the reinforced concrete structure may be covered by concrete, it is therefore very difficult to test its seismic intensity, and consumers are often not able to see the construction process of steel structure building in construction sites, and can only select trusted construction quality construction workers. Thus, it can be seen that, traditionally, it is difficult for consumers to ensure that they live in the building of good quality of seismic safety.

[0004] In view of the uneven quality of the current working groups for steel bar and concerns in whose growing age, the traditional construction methods applied for its construction quality are of worried consideration and have been unable to meet the needs of today's high-rise building quality steel for the structure. If it can be considered in advance in strengthening steel structures and structural design of reinforced steel processing stage, simplifying the positioning of steel structure, so that the working groups can quickly and

accurately accomplish the designs set by designers.

[0005] Therefore, the urgent demand for that is a steel structure and the related method thereof which contribute the safe seismic quality of buildings from the designs to the construction sites, so that from the steel structure design to the reinforced materials processing, in conjunction with the planning stage, the designs for steel structures are able to be considered in advance. As a result, it can ensure every detail of constructions along with the construction sites, so that the consuming publics are more confident of building quality.

SUMMARY OF THE INVENTION

[0006] The aspect of the embodiment of the present invention aims to steel structure for reinforced concrete wall panel and extended steel structure which is applicable to pillars to better the shock-proof quality of buildings and ensure the construction quality and acceleration in construction process.

[0007] One embodiment of the present invention may provide a steel structure for reinforced concrete wall panel, comprising at least one steel bar being bent to form a substantially enclosed region.

[0008] Wherein, the substantially enclosed region may be formed by bending a plurality of steel portions and the plurality of steel portions may be used to tie vertical located steel bars differentiating from other steel structures.

[0009] Wherein, when a number of the substantially enclosed region is a plurality, the plurality of substantially enclosed regions may be partitioned with roughly equal distance.

[0010] Wherein, when a number of the at least one steel bar is a plurality, the plurality of steel bars may be staggered to form the steel structure.

[0011] Wherein, the steel structure may be substantially linear shape, substantially “ $\sqcap$ ” shape, substantially right angle shape, substantially “T” shape or other corner shape.

[0012] Another embodiment of the present invention may provide a partition type steel structure tied between two horizontal located steel bars and formed by a steel bar constituted of a substantially enclosed region.

[0013] Another embodiment of the present invention may provide an extended steel

structure applicable to a pillar, comprising a steel bar having at least two bending long side steel portions and a short side steel portion, wherein one end of the at least two long side bending steel portions connects with the short side steel portion and another end of the at least two long side steel portions ties the pillar, and the at least two long side steel portions may be used to tie the other horizontal located steel bars.

[0014] Wherein, the steel bar may be bent to form a substantially enclosed region.

[0015] Wherein, the extended steel structure of the present invention further may comprise at least one partition type steel structure and the partition type steel structure tying the at least two long side steel portions.

[0016] Wherein, when a number of the substantially enclosed region is a plurality, the plurality of substantially enclosed regions may be partitioned with roughly equal distance.

[0017] One more embodiment of the present invention may provide a steel structure for reinforced concrete wall panel, comprising a first “U” shape steel bar and a second “U” shape steel bar, each of the first “U” shape steel bar and the second “U” shape steel bar may comprise two long side steel portions and a short side steel portion; wherein the short side steel portion of the first “U” shape steel bar may tie the long side steel portion of the second “U” shape steel bar, and the short side steel portion of the second “U” shape steel bar may tie the long side steel portion of the first “U” shape steel bar.

[0018] The corner shape steel structure of the present invention further may comprise a third “U” shape steel bar and two long side steel portions of the third “U” shape steel bar tying the two long side steel portions of the second “U” shape steel bar, respectively.

[0019] Wherein, the first “U” shape steel bar or the second “U” shape steel bar may further comprise a substantially enclosed region after being bent.

[0020] One more embodiment of the present invention may provide method of steel structure for reinforced concrete wall panel, comprising: arranging a plurality of preformed steel bars located vertically on a reinforced concrete wall panel; arranging a plurality of steel structures into the plurality of preformed steel bars, wherein each of the steel structures may comprise at least one steel bar being bent to form a substantially enclosed region; arranging the plurality of vertical located steel bars into the plurality of steel structures, respectively;

tying the plurality of vertical located steel bars locating on two end portions of the plurality of steel structures to the plurality of preformed steel bars; tying the plurality of steel structures to the plurality of vertical located steel bars locating on the two end portions, sequentially, wherein the plurality of steel structures may be partitioned with a predetermined distance; tying the other vertical located steel structures and the plurality of steel structures.

[0021] The present invention may have the following advantages of better shock resistance, higher quality, rapid construction and building safety.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] The drawings and description are to be regarded as illustrative in nature and not restrictive. Like reference numerals designate like elements throughout the specification.

FIG. 1A is a schematic diagram of the first embodiment of a steel structure according to the present invention.

FIG. 1B is a three dimensional perspective drawing of the first embodiment of a steel structure according to the present invention.

FIG. 1C is an assembling three dimensional perspective drawing of the first embodiment of a steel structure according to the present invention.

FIG. 2A is a schematic diagram of the second embodiment of a steel structure according to the present invention.

FIG. 2B is a three dimensional perspective drawing of the second embodiment of a steel structure according to the present invention.

FIG. 2C is an assembling three dimensional perspective drawing of the second embodiment of a steel structure according to the present invention.

FIG. 3A is a schematic diagram of the third embodiment of a steel structure according to the present invention.

FIG. 3B is a three dimensional perspective drawing of the third embodiment of a steel structure according to the present invention.

FIG. 3C is an assembling three dimensional perspective drawing of the third embodiment of a steel structure according to the present invention.

FIG. 4A is a schematic diagram of the fourth embodiment of a steel structure according to the present invention.

FIG. 4B is a three dimensional perspective drawing of the fourth embodiment of a steel structure according to the present invention.

FIG. 4C is an assembling three dimensional perspective drawing of the fourth embodiment of a steel structure according to the present invention.

FIG. 5A is a schematic diagram of the fifth embodiment of a steel structure according to the present invention.

FIG. 5B is a three dimensional perspective drawing of the fifth embodiment of a steel structure according to the present invention.

FIG. 5C is an assembling three dimensional perspective drawing of the fifth embodiment of a steel structure according to the present invention.

FIG. 6A is a schematic diagram of the sixth embodiment of a steel structure according to the present invention.

FIG. 6B is a three dimensional perspective drawing of the sixth embodiment of a steel structure according to the present invention.

FIG. 6C is an assembling three dimensional perspective drawing of the sixth embodiment of a steel structure according to the present invention.

FIG. 7A is a schematic diagram of the seventh embodiment of a steel structure according to the present invention.

FIG. 7B is a three dimensional perspective drawing of the seventh embodiment of a steel structure according to the present invention.

FIG. 7C is an assembling three dimensional perspective drawing of the seventh embodiment of a steel structure according to the present invention; and

FIG. 8A to FIG. 8F are flow charts of a method of a steel structure for reinforced concrete wall panel according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] As used herein, the term “and/or” includes any and all combinations of one or more

of the associated listed items. Expressions such as “at least one of,” when preceding a list of elements, modify the entire list of elements and do not modify the individual elements of the list.

[0024] The embodiment of the present invention is aimed to the reinforced concrete wall panel that is characterized of thinner thickness, high aspect ratio and larger area to improve the steel structure to strengthen the horizontal partition maintenance, two end portions, middle position or corner position of the reinforced concrete wall panel, so as to effectively promote the reinforced concrete wall panel as well as the shock resistance safety of buildings.

[0025] FIG. 1A is a schematic diagram of the first embodiment of a steel structure according to the present invention, FIG. 1B is a three dimensional perspective drawing of the first embodiment of a steel structure according to the present invention, and FIG. 1C is an assembling three dimensional perspective drawing of the first embodiment of a steel structure according to the present invention.

[0026] Please refer to par (i) of FIG. 1A along with part (i) of FIG. 1B, a steel structure of the present invention comprises at least one steel bar 11 being bent to form a substantially enclosed region 20. An integral steel structure is formed by bending the steel bar 11 and is applicable to strengthen the shock resistance for a reinforced concrete wall panel. It is noticeable that in order to explain and realize easily, two portions of the steel bar 11 illustrated in part (i) of FIG. 1A have openings, but in practical implement, the both end portions of the steel bar 11 are closely overlapped in principle. As region R1 of FIG. 1B shows that it promotes the restraining forces of concrete of end portion of opening and strengthens the effectiveness of shock resistance and avoids steel bar from being tied individually to reduce the shock resistance. Moreover, the both end portions of the steel bar 11 in the region R1 are staggered, but it shall not subject to this restriction. The both end portions of steel bar 11 can also closely overlap in horizontal or other directions depending on the needs. The aforementioned illustrations are suitable for all the following embodiments.

[0027] Generally, reinforced concrete wall panel is of thinner or larger length and width structure in a building structure, and thus it needs to increase the intensity of reinforced concrete wall panel to effectively promote the construction quality along with shock

resistance of whole buildings. Consequently, the steel structure of the first embodiment is between 15cm and 50cm, and the aspect ratio thereof is higher than 2.5:1; therefore, under the circumstance, the steel structure of the present invention enables to effectively promote the intensity of reinforced concrete wall panel along with the construction quality.

[0028] Please continue referring to part (ii) of FIG. 1A along with part (ii) of FIG. 1B which are a change type of the first embodiment. Two substantially enclosed regions 21, 22 are respectively formed on two sides of the integral steel structure by bending the steel bar 12. Basically, the substantially enclosed regions 21, 22 are formed by bending a plurality of steel portions and the plurality of steel portions are used to tie vertical located steel bars differentiating from other steel structures, for example, the vertical located reinforced steel bar 90 shown in FIG. 1C. Accordingly, the substantially enclosed regions 21, 22 can not only enhance the intensity through the integral enclosed steel portions, but also determine the tying position of the vertical located steel bar 90. Consequently, by using the steel structure of the present invention, working groups will be given uniform position for tying the vertical located steel bar 90 without personal decision, so that the safety of shock resistance can be applied from designs to construction sites, and every detail of constructions along with the construction sites can be ensured and the safety quality can be therefore promoted.

[0029] Please continue referring to part (iii) of FIG. 1A along with part (iii) of FIG. 1B which are a change type of the first embodiment. A substantially enclosed region 23 is formed on middle position of the integral steel structure by bending the steel bar 13 and the substantially enclosed region 23, in which is formed by bending a plurality of steel portions and the steel portions can control the partition of tying horizontal located steel bar to maintain parallel distance of the horizontal located steel bar so as to meet the demand for the working drawings of structure design and promote construction quality. In addition, a number of the substantially enclosed region 23 can be set as a plurality depending on its need. As part (v) of FIG. 1A shows that it maintains the horizontal distance of the horizontal located steel bar respectively; and the plurality of substantially enclosed regions are partitioned with roughly equal distance, preferably.

[0030] Please continue referring to part (iv) of FIG. 1A and part (iv) of FIG. 1B which are

a change type of the first embodiment of the present invention. The steel bar 131 is to combine the steel bar 12 and the steel bar 13 which are of bending characteristics and to respectively form the substantially enclosed regions 21, 22, 23 on two ends and middle positions of the integral steel structure.

[0031] Please continue referring to part (v) of FIG. 1A which is a change type of the first embodiment. The substantially enclosed regions 22, 22 are respectively formed on two ends of the integral steel structure by bending the steel bar 132 and a plurality of substantially enclosed regions 23 are formed in the middle position. Wherein, the pluralities of substantially enclosed regions are partitioned with roughly equal distance.

[0032] FIG. 2A is a schematic diagram of the second embodiment of a steel structure according to the present invention, FIG. 2B is a three dimensional perspective drawing of the second embodiment of a steel structure according to the present invention and FIG. 2C is an assembling three dimensional perspective drawing of the second embodiment of a steel structure according to the present invention.

[0033] The second embodiment is substantially a steel structure 14 of corner shape, and as part (i) of FIG. 2A and part (i) of FIG. 2B show that the steel structure 14 is bent to form a corner shape and has a substantially enclosed region 24 which is applicable to tie the vertical located steel bar 90. As part (ii) of FIG. 2A and part (ii) of FIG. 2B show that the steel structure 141 is bent to form a corner shape and has two substantially enclosed regions 24, 25 which are respectively used to tie the vertical located steel bar 90, as can be seen in FIG. 2C.

[0034] In addition, other than bending a steel bar to form integration, the steel structure of corner shape can be accomplished by two steel bars, too. Part (iii) of FIG. 2A is a change type of the second embodiment. Part (iii) of FIG. 2A comprises two steel bars 142, 143 forming a substantially enclosed region and the steel bars are staggered to form the steel structure of corner shape.

[0035] FIG. 3A is a schematic diagram of the third embodiment of a steel structure according to the present invention, FIG. 3B is a three dimensional perspective drawing of the third embodiment of a steel structure according to the present invention and FIG. 3C is an assembling three dimensional perspective drawing of the third embodiment of a steel structure

according to the present invention.

[0036] The third embodiment is the steel structure 15 which is substantially “T” shape. As part (i) of FIG. 3A and part (i) of FIG. 3B show that the steel structure 15 forms a “T” shape after being bent and has a substantially enclosed region 26 which is used to tie the vertical located steel bar. Part (iii) of FIG. 3A and part (iii) of FIG. 3B are a change type of the third embodiment. The steel structure 151 forms a “T” shape after being bent and have two substantially enclosed regions 26, 27 which are respectively used to tie the vertical located steel bar 90, as can be seen in FIG. 3C.

[0037] In addition, other than bending steel bar to form integration, the “T” shape steel structure can be accomplished by two steel bars, too. Part (iii) of FIG. 3A shows a change type of the third embodiment. Part (iii) of FIG. 3A comprises two steel bars 152, 153 forming a substantially enclosed region and the steel bars are staggered to form the steel structure of corner shape.

[0038] FIG. 4A is a schematic diagram of the fourth embodiment of a steel structure according to the present invention, FIG. 4B is a three dimensional perspective drawing of the fourth embodiment of a steel structure according to the present invention and FIG. 4C is an assembling three dimensional perspective drawing of the fourth embodiment of a steel structure according to the present invention.

[0039] The fourth embodiment is the steel structure 16 which is substantially “┐” shape. As part (i) of FIG. 4A and part (i) of FIG. 4B show that the steel structure 16 forms a “┐” shape after being bent and has two substantially enclosed regions 28, 29 which are used to tie the vertical located reinforced steel bar 90, as can be seen in FIG. 4C.

[0040] In the fourth embodiment, other than forming a substantially enclosed region in corner position, the substantially enclosed region can also be formed on the other regions of the steel structure, for example, the substantially enclosed region 26 as shown in FIG. 3A.

[0041] According to the aforementioned description, the steel structure for reinforced concrete wall panel of the present invention is substantially linear shape, substantially “┐” shape, substantially right angle shape, substantially “T” shape, other corner shape or the like, but it shall not subject to this restriction. Those steel structures for reinforced concrete wall

panel matching the integrated concept of the present invention all belong to scope of the present invention. In addition, shape of bending angle of steel structure shall not subject to this restriction, too.

[0042] FIG. 5A is a schematic diagram of the fifth embodiment of a steel structure according to the present invention, FIG. 5B is a three dimensional perspective drawing of the fifth embodiment of a steel structure according to the present invention and FIG. 5C is an assembling three dimensional perspective drawing of the fifth embodiment of a steel structure according to the present invention.

[0043] The steel structure of the fifth embodiment is applicable to partition type steel structure and comprises the steel bar 51 forming a substantially enclosed region 52 as shown in FIGS. 5A and 5B. The partition type steel structure is tied between two horizontal located steel bars 53 particularly that of longer length so as to maintain the distance between the two horizontal located steel bars as shown in FIG. 5C. In addition, it is not limited to use the partition type steel structure to two individual horizontal located steel bars, and the partition type steel structure can also be used between any two horizontal located steel bars of the steel structure of the preceding embodiment to strengthen the distance of the two steel portions.

[0044] The aforementioned steel structure is explained by a steel bar; however, the steel structure of the present invention further comprises a steel structure formed by tying a plurality of steel bars.

[0045] FIG. 6A is a schematic diagram of the sixth embodiment of a steel structure according to the present invention, FIG. 6B is a three dimensional perspective drawing of the sixth embodiment of a steel structure according to the present invention and FIG. 6C is an assembling three dimensional perspective drawing of the sixth embodiment of a steel structure according to the present invention.

[0046] The sixth embodiment is a corner shape steel structure of the reinforced concrete wall panel. The steel structure shown in part (i) of FIG. 6A and part (i) of FIG. 6B comprises a first "U" shape steel bar 61 and a second "U" shape steel bar 62, each of the first "U" shape steel bar and the second "U" shape steel bar comprises two long side steel portions and a short side steel portion; wherein the short side steel portion of the first "U" shape steel bar ties the

long side steel portion of the second “U” shape steel bar, and the short side steel portion of the second “U” shape steel bar ties the long side steel portion of the first “U” shape steel bar so as to form the corner shape steel structure.

[0047] Please continue referring to part (ii) of FIG. 6A and part (ii) of FIG. 6B. The steel structure comprises the steel bar 11 shown in FIG. 1A and the steel bar 64 forming two substantially enclosed regions after being bent, the steel bar 11 and steel bar 64 are tied to from the corner steel structure and the substantially enclosed regions are used to tie the vertical located steel bar 90 as shown in FIG. 6C.

[0048] FIG. 7A is a schematic diagram of the seventh embodiment of a steel structure according to the present invention, FIG. 7B is a three dimensional perspective drawing of the seventh embodiment of a steel structure according to the present invention and FIG. 7C is an assembling three dimensional perspective drawing of the seventh embodiment of a steel structure according to the present invention.

[0049] The seventh embodiment of the present invention is the steel structure which is applicable to a pillar or a beam. For the sake of easily explaining, a pillar is exemplified in the following description. In part (i) of FIG. 7A and part (i) of FIG. 7B, the embodiment is an extended steel structure which is applicable to a pillar 70 comprising a steel bar 70 having at least two bending long side steel portions 73 and a short side steel portion 72, wherein one end of the at least two long side bending steel portions 73 connects with the short side steel portion 72 and another end of the at least two long side steel portions 73 ties the pillar 70, and the at least two long side steel portions are used to tie the other horizontal located steel bars so as to promote the shock resistance of longer distance wall and the construction quality.

[0050] Please continue referring to part (ii) of FIG. 7A and part (ii) of FIG. 7B which are a change type of the seventh embodiment. The steel bar 711 is bent to form at least one substantially enclosed region in the middle portion so as to form the extended steel structure. The substantially enclosed region is suitable for tying the vertical located steel bar 90 as can be seen in FIG. 7C.

[0051] Please refer to FIG. 8A to FIG. 8F which are flow charts of a method of a steel structure for reinforced concrete wall panel according to the present invention. The method of

the reinforced concrete wall panel of the present invention comprises the following steps. Firstly, in FIG. 8A, the desired construction position is placed on a reinforced concrete wall panel 80 according to the design, and a plurality of preformed vertical located steel bars 81 is arranged on the reinforced concrete wall panel 80. Subsequently, in FIG. 8B, the plurality of steel structures 82 of the present invention is arranged into the plurality of preformed steel bars 81, and in FIG. 8C, the plurality of vertical located steel bars 83 is arranged into the steel structure 82. Next, in FIG. 8D, the vertical located steel bars 83 locating in two end portions of the steel structure 82 are tied with the preformed steel bars 81 so that the vertical located steel bars 83 are in a vertical position. In the FIGS., the mark "X" 84 denotes the fixed location of the vertical located steel bars 83 and the preformed steel bar 81 and the two fixed steel bars are indicated with a thicker straight line.

[0052] In FIG. 8E, it follows the steel structure's position according to the design, and each steel structure 81 is tied sequentially between the vertical located steel bar 83 locating in two end portions from top and sown; namely, the steel structure 82 in higher position is tied and then that in a lower position is tied. In FIG. 8F, the other vertical located steel bars 82 are tied sequentially according to the vertical located steel bar's position based on the design so as to accomplish the arrangement of the integral reinforced concrete wall panel.

[0053] While the means of specific embodiments in present invention has been described by reference drawings, numerous modifications and variations could be made thereto by those skilled in the art without departing from the scope and spirit of the invention set forth in the claims. The modifications and variations should in a range limited by the specification of the present invention.

WHAT IS CLAIMED IS:

1. A steel structure for reinforced concrete wall panel, comprising
at least one steel bar being bent to form a substantially enclosed region.
2. The steel structure for reinforced concrete wall panel of claim 1, wherein the
substantially enclosed region is formed by bending a plurality of steel portions and the
plurality of steel portions are used to tie vertical located steel bars differentiating from
other steel structures.
3. The steel structure for reinforced concrete wall panel of claim 1, wherein when a number
of the substantially enclosed region is a plurality, the plurality of substantially enclosed
regions are partitioned with the roughly equal distance.
4. The steel structure for reinforced concrete wall panel of claim 1, wherein when a number
of the at least one steel bar is plurality, the plurality of steel bars are staggered to form the
steel structure.
5. The steel structure for reinforced concrete wall panel of claim 1, wherein the steel
structure is substantially linear shape, substantially “” shape, substantially right angle
shape, substantially “T” shape or other corner shape.
6. A partition type steel structure tied between two horizontal located steel bars and formed
by a steel bar constituted of a substantially enclosed region.
7. An extended steel structure applicable to a pillar, comprising a steel bar having at least
two bending long side steel portions and a short side steel portion, wherein one end of the
at least two long side steel portions connects with the short side steel portion and another
end of the at least two long side steel portions ties the pillar, and the at least two long side
steel portions are used to tie the other horizontal located steel bars.
8. The extended steel structure of claim 7, wherein the steel bar is bent to form a
substantially enclosed region.
9. The extended steel structure of claim 7, further comprising at least one partition type steel
structure and the partition type steel structure tying the at least two long side steel
portions.
10. The extended steel structure of claim 7, wherein when a number of the substantially

enclosed region is a plurality, the plurality of substantially enclosed regions are partitioned with roughly equal distance.

11. A steel structure for reinforced concrete wall panel, comprising a first “U” shape steel bar and a second “U” shape steel bar, each of the first “U” shape steel bar and the second “U” shape steel bar comprises two long side steel portions and a short side steel portion; wherein the short side steel portion of the first “U” shape steel bar ties the long side steel portion of the second “U” shape steel bar, and the short side steel portion of the second “U” shape steel bar ties the long side steel portion of the first “U” shape steel bar.
12. The steel structure for reinforced concrete wall panel of claim 11, further comprising a third “U” shape steel bar and two long side steel portions of the third “U” shape steel bar tying the two long side steel portions of the second “U” shape steel bar, respectively.
13. The steel structure for reinforced concrete wall panel of claim 11, wherein the first “U” shape steel bar or the second “U” shape steel bar further comprises a substantially enclosed region after being bent.
14. A method of steel structure for reinforced concrete wall panel, comprising:
 - arranging a plurality of preformed steel bars located vertically on a reinforced concrete wall panel;
 - arranging a plurality of steel structures into the plurality of preformed steel bars, wherein each of the steel structures comprises at least one steel bar being bent to form a substantially enclosed region;
 - arranging the plurality of vertical located steel bars into the plurality of steel structures, respectively;
 - tying the plurality of vertical located steel bars locating on two end portions of the plurality of steel structures to the plurality of preformed steel bars;
 - tying the plurality of steel structures to the plurality of vertical located steel bars locating on the two end portions, sequentially, wherein the plurality of steel structures are partitioned with a predetermined distance;
 - tying the other vertical located steel structures and the plurality of steel structures.