

JOINT STRUCTURE OF STEEL H-SHAPES AND JOINING METHOD OF STEEL H-SHAPES

[Technical Field of the Invention]

[0001]

The present invention relates to a joint structure and a joining method suitable for joining heavy H-shapes used as column members of a building structure, in particular.

Priority is claimed on Japanese Patent Application No. 2015-230440, filed November 26, 2015, the content of which is incorporated herein by reference.

[Related Art]

[0002]

A steel H-shapes is widely used as a column member of a building structure, and in the case of a large scale structure, a heavy H-shapes having a very large cross section is used. The steel H-shapes is cut to a predetermined length due to restrictions of manufacturing and transportation, and when the steel H-shapes is used as a column member, it is necessary to join the steel H-shapes at a factory or a construction site. For example, welding joining by gas shielded arc welding may be performed as a joining method of the column member. However, in a case where the steel member has a very large cross section, it is necessary to perform multi-pass welding, which takes a lot of time, and thus, manufacturing efficiency deteriorates.

[0003]

In Patent Document 1, a column-to-column connection welding method of a heavy H-shapes is disclosed in which a groove section is provided on a flange in a diagonal direction, backing plates are provided inside and outside the flange so as to surround the groove section, and electroslog welding is performed along a groove line.

[Prior Art Documents]

[Patent Documents]

[0004]

[Patent Document 1] Japanese Patent No. 4038003

[Disclosure of the Invention]

[Problems to be Solved by the Invention]

[0005]

However, in the case of Patent Document 1, in order to perform the welding, processing for cutting off a flange to provide the groove section or processing for providing a weld access hole on a web is required and the web is joined by a bolt or welded, and thus, many processes are required, which takes a lot of time and efforts.

[0006]

The present invention is made to solve the above-described problems, and an object thereof is to decrease the number of parts or the number of processing steps in the manufacture of joints of steel H-shapes and to efficiently manufacture column-to-column connection of the steel H-shapes in a simple component configuration and in a simple process.

[Means for Solving the Problem]

[0007]

In order to achieve the above-described objects, the present invention adopts the following aspects.

[0008]

(1) According to a first aspect of the present invention, there is provided a joint structure in which flat end surfaces of a pair of steel H-shapes each having a web, flanges, and fillets are joined to each other, the joint structure including: a weld metal

which is formed between end surfaces of the flanges; and a steel bearing plate disposed between end surfaces of the webs such that an upper surface and a lower surface of the steel bearing plate come into surface contact with an entire end surface of the webs, and that side surfaces of the steel bearing plate fuse integrally with the weld metal.

According to this configuration, the end surfaces of the webs are joined to each other via the steel bearing plate and the end surfaces of the flanges are joined to each other via the weld metal. Therefore, it is possible to obtain a state of metal touch not requiring welding with respect to the end surfaces of the webs which mainly transmit compressive stress. Accordingly, it is possible to efficiently manufacture the column-to-column connection of the steel H-shapes without performing special processing for forming a groove, a weld access hole, or the like on the end surface of the steel H-shapes.

[0009]

(2) In the joint structure according to the above (1), the weld metal may be formed by electroslag welding or electrogas arc welding.

According to this configuration, it is possible to join the flanges by complete joint penetration welds. Therefore, it is possible to increase the resistance with respect to the flexural buckling.

(3) In the joint structure according to the above (1), the steel bearing plate and the webs may be fillet welded to each other.

According to this configuration, it is possible to increase the resistance with respect to shearing.

(4) In the joint structure according to the above (1), each of the upper surface and the lower surface of the steel bearing plate may come into surface contact with end surfaces of each fillet.

According to this configuration, backing plates disposed at positions corresponding to the end surfaces of the fillets are not indispensable when the electroslag welding or electrogas arc welding is performed. Therefore, it is possible to easily and reliably prevent leakage of molten slag or molten metal from the vicinities of the fillets.

(5) In the joint structure according to the above (1), each of the upper surface and the lower surface of the steel bearing plate may come into surface contact with a portion of the end surface of each flange over an entire length of the flange in a width direction.

According to this configuration, it is possible to easily and reliably prevent the leakage of the molten slag or the molten metal when the electroslag welding or electrogas arc welding is performed. Moreover, the steel bearing plate extends over the entire length of each flange in the width direction, and thus, the backing plates which are disposed on the inner surfaces of the flanges are not required when the electroslag welding or electrogas arc welding is performed.

[0010]

(6) In the joint structure according to the above (1), the joint structure may further include an inner surface side backing plate which is attached to an inner surface of each flange and the weld metal.

According to this configuration, it is possible to easily and reliably prevent the leakage of the molten slag or the molten metal when the electroslag welding or electrogas arc welding is performed.

(7) In the joint structure according to the above (6), an R portion which comes into surface contact with a surface of each fillet and a convex part which comes into surface contact with a surface of the steel bearing plate may be formed on the

inner surface side backing plate.

According to this configuration, even in a case where the steel bearing plate comes into surface contact with only the entire end surface of each web, it is possible to easily and reliably prevent the leakage of the molten slag or the molten metal when the electroslog welding or electrogas arc welding is performed.

(8) In the joint structure according to the above (6), an R portion which comes into surface contact with a surface of each fillet and a concave part into which the steel bearing plate is fitted may be formed on the inner surface side backing plate.

According to this configuration, even in a case where the steel bearing plate comes into surface contact with the entire end surface of each web and the fillets, it is possible to easily and reliably prevent the leakage of the molten slag or the molten metal when the electroslog welding or electrogas arc welding is performed.

(9) In the joint structure according to the above (1), the joint structure may include an outer surface side backing plate which is attached to an outer surface of each flange and the weld metal.

According to this configuration, it is possible to easily and reliably prevent the leakage of the molten slag or the molten metal when the electroslog welding or electrogas arc welding is performed.

[0011]

(10) According to a second aspect of the present invention, there is provided a joining method of steel H-shapes for joining flat end surfaces of a pair of steel H-shapes each having a web, flanges, and fillets to each other, the joining method including: disposing a steel bearing plate between end surfaces of the webs such that an upper surface and a lower surface of the steel bearing plate come into surface contact with an entire end surface of the webs; and performing electroslog welding or

electro gas arc welding on end surfaces of the flanges in a state where a gap formed between the end surfaces of the flanges is closed.

According to this configuration, the end surfaces of the webs are joined to each other via the steel bearing plate and the end surfaces of the flanges are joined to each other via the weld metal. Therefore, it is possible to obtain a state of metal touch not requiring welding with respect to the end surfaces of the webs which mainly transmit compressive stress. Accordingly, it is possible to efficiently manufacture the column-to-column connection of the steel H-shapes without performing special processing for forming a groove, a weld access hole, or the like on the end surface of the steel H-shapes.

[Effects of the Invention]

[0012]

According to the present invention, it is possible to efficiently manufacture the column-to-column connection of the steel H-shapes without performing special processing such as forming a weld access hole or the like in the steel H-shapes. Therefore, productivity of a building structure using the steel H-shapes as the column member is improved, which can contribute to shortening a construction period. Particularly, even in a case of a heavy H-shapes, it is possible to efficiently manufacture the column-to-column connection.

[Brief Description of the Drawings]

[0013]

FIG. 1 is an explanatory view of designations of a direction, a dimension, or the like of a steel H-shapes in the present specification.

FIG. 2 is a perspective view of a joint structure according to an embodiment of the present invention.

FIG. 3A is a view showing a width dimension of a steel bearing plate with respect to an end surface of the steel H-shapes in the joint structure.

FIG. 3B is a side view of the joint structure.

FIG. 3C is a perspective view of inner surface side backing plates of the joint structure.

FIG. 4 is an exploded perspective view showing an example of a joining method of the steel H-shapes in order to obtain the joint structure.

FIG. 5 is a sectional view showing the joining method in a case where a water-cooled copper backing plate is used.

FIG. 6 is a perspective view of a joint structure according to a first modification example of the present invention.

FIG. 7A is a view showing a width dimension of a steel bearing plate with respect to an end surface of the steel H-shapes in the joint structure.

FIG. 7B is a side view of the joint structure.

FIG. 7C is a perspective view of inner surface side backing plates of the joint structure.

FIG. 8 is a perspective view of a joint structure according to a second modification example of the present invention.

FIG. 9A is a view showing a width dimension of a steel bearing plate with respect to an end surface of the steel H-shapes in the joint structure.

FIG. 9B is a side view of the joint structure.

FIG. 10 is a perspective view of a joint structure according to a third modification example of the present invention.

FIG. 11A is a view showing a width dimension of a steel bearing plate with respect to an end surface of the steel H-shapes in the joint structure.

FIG. 11B is a side view of the joint structure.

FIG. 11C is a perspective view of inner surface side backing plates of the joint structure.

[Embodiments of the Invention]

[0014]

Hereinafter, an embodiment of the present invention will be described with reference to the drawings. In addition, in the present specification and the drawings, the same reference numerals are assigned to elements having substantially the same functional configurations, and overlapping descriptions thereof are omitted.

[0015]

The present invention is conceived of a joint structure of a steel H-shapes which can be easily manufactured using electroslag welding or electrogas arc welding by taking advantage of large heat input welding characteristics of the steel H-shapes manufactured by rolling, and, particularly, the present invention is suitable for joining heavy H-shapes used as column members.

[0016]

First, terms used in the present specification will be described with reference to FIG. 1.

As shown in FIG. 1, a steel H-shapes 10 used in the following embodiment includes a pair of flanges 11 in which sectional shapes thereof are parallel to each other, a web 12 which is perpendicularly connected to the pair of flanges 11, and fillets 13 which are formed between the flanges 11 and the web 12.

Each of the fillets 13 is a curved portion between the flange 11 and the web 12, and an end of the curved portion in a sectional shape of the fillet is referred to as an R stop 14.

In the pair of flanges 11, surfaces facing outward are referred to as outer surfaces 11a and surfaces facing inward are referred to as inner surfaces 11b.

In FIG. 1, a indicates a “width of the flange”, b indicates an “internal height of the web”, c indicates a “thickness of the flange”, and d indicates a “thickness of the web”. In addition, wf is a “flange width wf between the R stops”, and means a distance in a flange width direction between the R stops of both fillets on an inner surface of the flange.

[0017]

FIGS. 2 and 3A to 3C are views showing a configuration of a joint structure 1 of the steel H-shapes according to an embodiment of the present invention.

In the joint structure 1 according to the present embodiment, a steel bearing plate 2 transmitting a vertical load applied to a pair of steel H-shapes 10 is disposed between the webs 12 of the pair of steel H-shapes having the same sectional shape dimension, and the webs 12 abut on each other in a state where the steel bearing plate 2 is interposed therebetween. That is, the webs 12 of the pair of steel H-shapes 10 abut on each other by metal touch transmitting only compressive stress.

Meanwhile, the flanges 11 which need to resist flexural buckling are joined to each other via a weld metal 15 formed by electroslog welding. Accordingly, the flanges 11 are not joined by the metal touch and are integrally joined to each other by complete joint penetration welds.

That is, the steel bearing plate 2 is disposed between end surfaces of the webs 12 such that an upper surface and a lower surface of the steel bearing plate 2 come into surface contact with the entire flat end surfaces of the webs 12, and that side surfaces thereof integrally fuse with the weld metal 15.

[0018]

In the joint structure 1 according to the present embodiment, the width w of the steel bearing plate 2 is the same as the flange width w_f between the R stops. Accordingly, the steel bearing plate 2 is disposed with the center plane of the web 12 as a substantially symmetric plane in a state where the upper surface and the lower surface thereof come into surface contact with the webs 12 and the fillets 13 to cover the entire end surfaces of the webs 12 and the end surfaces of the fillets 13.

In addition, as shown in FIG. 3A, the length of the steel bearing plate 2 in a direction perpendicular to the width w of the steel bearing plate 2 is the same as the internal height b of the web 12.

A thickness t_2 of the steel bearing plate 2 is the same as a gap g (refer to FIG. 2) between the flanges 11 of the pair of steel H-shapes 10 facing each other via the steel bearing plate 2. The gap g is a gap for forming the weld metal 15 by electroslag welding.

Accordingly, the thickness t_2 of the steel bearing plate 2 is approximately 10 mm to 60 mm, and preferably, approximately 15 mm to 30 mm such that a nozzle can be inserted into the gap g when the electroslag welding is performed.

In the present specification, the term "weld metal" is a metal melt-solidified during welding and does not include a welded heat-affected zone.

[0019]

As shown in FIG. 3B, outer surface side backing plates 3 and inner surface side backing plates 4 which are larger in the dimensions in a steel H-shapes longitudinal direction than the thickness t_2 of the steel bearing plate 2, are disposed on the outer surfaces 11a and the inner surface 11b of the flanges 11.

As shown in FIG. 3C, each of the outer surface side backing plate 3 and the inner surface side backing plate 4 has a substantially rectangular parallelepiped shape.

The outer surface side backing plates 3 and the inner surface side backing plates 4 are provided to close the gap g between the steel H-shapes 10 and 10 such that molten slag and molten metal do not flow out of a welding area when electrosag welding is performed on the flanges 11.

In the joint structure 1 according to the present embodiment, in order to increase a resistance to flexural buckling, the outer surface side backing plates 3 and the inner surface side backing plates 4 formed of steel plates are attached to the steel H-shapes 10 even after the welding. That is, the outer surface side backing plates 3 and the inner surface side backing plates 4 are attached to the flanges 11 and the weld metal 15.

In addition, in the present specification, the “steel H-shapes longitudinal direction” indicates a material length direction of the steel H-shapes 10 itself used as the column member.

[0020]

In the joint structure 1 according to the present embodiment, each of the outer surface side backing plates 3 provided on the outer surfaces 11a of the flanges 11 is a flat steel plate which closes an outer surface side of the gap g between the flanges 11. In addition, a dimension of the outer surface side backing plate 3 in the longitudinal direction of the steel H-shapes 10 is larger than the gap g between the steel H-shapes 10, that is, the thickness t_2 of the steel bearing plate 2, and a dimension of the outer surface side backing plate 3 in the flange width direction is the same as a flange width a .

[0021]

Meanwhile, as shown in dotted lines in FIG. 3A, the inner surface side backing plates 4 provided on the inner surface 11b of the flanges 11 are disposed on

both sides in the width direction of the flange 11 with the width w of the steel bearing plate 2. Accordingly, each inner surface side backing plate 4 is a flat plate in which the dimension of the inner surface side backing plate 4 in the longitudinal direction of the steel H-shapes 10 is larger than the gap g between the steel H-shapes 10, that is, the thickness t_2 of the steel bearing plate 2, and the dimension of the inner surface side backing plate 4 in the flange width direction is a length from the end of the flange 11 to the side surface of the steel bearing plate 2.

In the joint structure 1 according to the present embodiment, the steel bearing plate 2 covers the fillets 13 so as to come into surface contact with the fillets 3, and thus, each inner surface side backing plate 4 can use an approximately rectangular flat plate which comes into contact with the inner surfaces of the flanges 11 and the side surface of the steel bearing plate 2 without considering the shapes of the fillets 13. As shown by dotted lines in FIG. 3A, the inner surface side backing plates 4 are disposed on the inner surfaces of both flanges 11 on both sides in a state where the steel bearing plate 2 is interposed therebetween.

[0022]

The outer surface side backing plates 3 and the inner surface side backing plates 4 are disposed as described above, and thus, the gap g between the flanges 11 is closed, a space surrounded by the end portions of the flanges 11, the outer surface side backing plates 3, and the inner surface side backing plates 4 is formed, and it is possible to form the weld metal 15 by electrosag welding.

[0023]

Next, an example of a joining method of the steel H-shapes 10 will be described.

[0024]

As shown in FIG. 4, the steel bearing plate 2 which has the same width as the flange width w_f between the R stops and covers the webs 12 and the fillets 13 so as to come into surface contact with the entire end surfaces of the webs 12 and the end surfaces of the fillets 13 are disposed between the webs 12 of the pair of steel H-shapes 10 which is a material to be joined with the center plane of each web 12 as a substantially symmetric plane.

[0025]

Moreover, the webs 12 abut on each other in a state where the steel bearing plate 2 is interposed therebetween, and the outer surface side backing plates 3 and the inner surface side backing plates 4 formed of steel plates are disposed on the outer surfaces 11a and the inner surfaces 11b of the flanges 11 to close the gap between the pair of steel H-shapes 10.

[0026]

Thereafter, the gap between the flanges 11 is joined by electroslag welding. In this case, a welding wire is inserted into the gap between the flanges 11 and the space surrounded by the outer surface side backing plates 3 and the inner surface side backing plates 4, and welding is performed.

In the electroslag welding or the electrogas arc welding, it is impossible to make a welding proceeding direction horizontal so as to avoid outflow of molten slag and molten metal. Accordingly, preferably, the welding is performed in a state where the flange width direction is set to a vertical direction.

[0027]

In a case where the outer surface side backing plates 3 and the inner surface side backing plates 4 are steel plates, after the welding, the joint structure 1 is configured in a state where the outer surface side backing plates 3 and the inner surface

side backing plates 4 are attached to the steel H-shapes 10. In a case where water-cooled copper backing plates, ceramic backing plates, or flux backing plates are used as the outer surface side backing plates 3 and the inner surface side backing plates 4, the outer surface side backing plates 3 and the inner surface side backing plates 4 are removed after welding and used repeatedly. In addition, in a case where the outer surface side backing plates 3 and the inner surface side backing plates 4 are removed, the surface of the weld metal 15 is flush with the outer surface and the inner surface of each flange 11.

FIG. 5 is a view showing an example of a welding method in a case where the water-cooled copper backing plates are used as the outer surface side backing plates 3 and the inner surface side backing plates 4. As shown in FIG. 5, the outer surface side backing plates 3 are disposed so as to close a portion of the gap between the steel H-shapes 10 with respect to the outer surfaces 11a of the flanges 11 and the outer surface side backing plates 3 sequentially slide according to a welding position by a welding wire 9.

[0028]

In the joint structure 1 according to the present embodiment, the webs 12 of the steel H-shapes 10 abut on each other by metal touch and the flanges 11 are complete joint penetration welded by electroslog welding or electrogas arc welding. Accordingly, it is possible to join the steel H-shapes to each other easily and quickly using the end surfaces of the products of steel H-shapes 10 as they are.

[0029]

For example, the joint structure 1 is a structure of column-to-column connection of heavy H-shapes mainly for supporting vertical loads such as a king-post or a pillar of a building with a base isolation system, or the like and is specialized in a

column-to-column connection. Accordingly, the structure of the joint structure 1 is simplified and the number of processing can be reduced. That is, compared to a method of forming a groove on the web 12 to perform multi-pass welding or a method of welding the web 12 by electroslag welding or the like, it is possible to largely reduce man-hours and time.

Moreover, in the present embodiment, the heavy H-shapes indicates a steel H-shapes in which the plate thickness of the flange is 40 mm or more.

In addition, in a case where the steel bearing plate 2 is fillet welded to the webs 12, it is possible to transmit a shear force to the webs 12, and thus, it is possible to efficiently increase resistance to the shear force. In the joint structure 1 according to the present embodiment, the steel bearing plate 2 covers the fillets 13 so as to come into surface contact with the fillets 13. Accordingly, by performing the fillet welding on step portions generated between the webs 12 and the steel bearing plate 2, the shear force can be transmitted without performing special processing such as forming a groove on a material to be welded (steel H-shapes) and the steel bearing plate.

[0030]

In addition, by joining the flanges 11 to each other by electroslag welding, it is possible to perform efficient and high-quality joining in one pass, and compared to a method of joining the heavy H-shapes or the like in the related art, for example, compared to a method of forming a groove on a member to be joined and joining the member by multi-pass welding, it is possible to largely decrease the manufacturing time of the joint.

For example, in a case where the steel H-shapes each including the flange having a plate thickness of 100 mm are welded to each other, the joint can be performed in approximately 30 minutes in the case of the electroslag welding while 20

hours or more are required for the multi-pass welding.

[0031]

Moreover, in the case where the electroslag welding is performed, by covering the fillets 13 of the steel H-shapes 10 with the upper surface and the lower surface of the steel bearing plate 2 and by merely disposing extremely simple flat backing plates on the outer surfaces of the flanges 11 and on the inner surface if necessary, it is possible to easily and reliably prevent leakage of molten slag and molten metal without requiring forming a groove, a weld access hole, or the like on the member to be joined (steel H-shapes).

Therefore, according to the joint structure 1 according to the present embodiment, by using merely extremely simple parts, for example, the end surface of the steel H-shapes 10 can be processed to be flat by sawing processing, gas fusion cutting processing or the like without performing special processing on the joining face of the steel H-shapes 10 or the vicinity thereof, and it is possible to efficiently manufacture a column-to-column connection structure having high quality.

In addition, in the present embodiment, the joint structure 1 is configured in the state where the outer surface side backing plates 3 and the inner surface side backing plates 4 formed of steel plates are attached to the steel H-shapes 10 even after the welding. However, the outer surface side backing plates 3 and the inner surface side backing plates 4 may be removed after the welding. In this case, preferably, water-cooled copper backing plates, ceramic backing plates, or flux backing plates are used as the outer surface side backing plates 3 and the inner surface side backing plates 4. Accordingly, the backing plates can be repeatedly used, and thus, it is possible to manufacture the joint structure 1 extremely economically.

[0032]

Hereinbefore, a preferred embodiment of the present invention is described. However, the present invention is not limited to the embodiment. A person skilled in the art will appreciate that various modifications or corrections can be conceived within a scope of a technical idea described in the claims and the modifications and corrections are included in a technical scope of the present invention.

[0033]

For example, like a joint structure 1A according to a first modification example shown in FIGS. 6 and 7A to 7C, instead of the inner surface side backing plates 4, inner surface side backing plates 4A may be used, in which R portions coming into surface contact with the surfaces of the fillets and concave parts to which the steel bearing plate is fitted are formed.

By using the inner surface side backing plates 4A, even in a case where the steel bearing plate 2 comes into surface contact with the entire end surfaces of the webs 12 and the end surfaces of the fillets 13, it is possible to more easily and reliably prevent leakage of molten slag or molten metal when the electroslag welding is performed.

[0034]

Moreover, like a joint structure 1B according to a second modification example shown in FIGS. 8, 9A, and 9B, each of the upper surface and the lower surface of the steel bearing plate 2 may come into surface contact with a portion of the end surfaces of the flanges 11 over the entire length of each flange 11 in the width direction.

In this case, the width w of the steel bearing plate 2 is the same as the flange width a (refer to FIG. 1) of the steel H-shapes 10, and the length of the steel bearing plate 2 in a direction perpendicular to the width w is longer than the internal height b

of the web. Accordingly, as shown in FIGS. 9A and 9B, both end portions of the steel bearing plates 2 in the length direction are disposed to be embedded in the gap between both flanges 11 of the pair of steel H-shapes 10. In this case, the steel bearing plate 2 closes the inner surface sides of the flanges 11, and thus, the inner surface side backing plates 4 are not required, and the outer surface side backing plates 3 similar to those of the embodiment shown in FIGS. 2 and 3A to 3C are disposed on only the outer surfaces.

[0035]

Moreover, like a joint structure 1C according to a third modification example shown in FIGS. 10 and 11A to 11C, instead of the inner surface side backing plates 4, inner surface side backing plates 4C may be used in which R portions coming into surface contact with the surfaces of the fillets 13 and convex parts coming into surface contact with the surface of the steel bearing plate are formed.

In the joint structure 1C according to this modification example, the R portions of the inner surface side backing plates 4C and the convex parts come into surface contact with the surfaces of the fillet 13 and the surfaces of the steel bearing plate 2 to form a shaped flange welding groove (having a substantially rectangular parallelepiped shape), and thus, the width w of the steel bearing plate 2 can be the same as the thickness of the web. In addition, the R portions of the inner surface side backing plates 4C and the convex parts come into surface contact with the fillet 13 and the steel bearing plate 2, and thus, it is possible to more easily and reliably prevent the leakage of the molten slag or molten metal when the electroslag welding is performed.

[0036]

Moreover, in the embodiment, the joining between the flanges 11 is performed by the electroslag welding. However, the joining may be performed by electrogas arc

welding. In addition, in the embodiment, the pair of steel H-shapes having the same sectional shape is used. However, the sectional shapes may not be completely the same as each other within a range where the present invention can be applied.

[Industrial Applicability]

[0037]

The present invention can be applied to a joint structure of steel H-shapes such as a building structure which is mainly subjected to a compressive force.[Brief

Description of the Reference Symbols]

[0038]

1, 1A, 1B, 1C: joint structure

2: steel bearing plate

3: outer surface side backing plate

4, 4A, 4C: inner surface side backing plate

10: steel H-shapes

11: flange

12: web

13: fillet

14: R stop

15: weld metal

CLAIMS

What is claimed is:

1. A joint structure in which flat end surfaces of a pair of steel H-shapes each having a web, flanges, and fillets are joined to each other, the joint structure comprising:

a weld metal which is formed between end surfaces of the flanges; and

a steel bearing plate disposed between end surfaces of the webs such that an upper surface and a lower surface of the steel bearing plate come into surface contact with an entire end surface of the webs, and that side surfaces of the steel bearing plate fuse integrally with the weld metal.

2. The joint structure of the steel H-shapes according to claim 1, wherein the weld metal is formed by electroslog welding or electrogas arc welding.

3. The joint structure of the steel H-shapes according to claim 1, wherein the steel bearing plate and the webs are fillet welded to each other.

4. The joint structure of the steel H-shapes according to claim 1, wherein each of the upper surface and the lower surface of the steel bearing plate comes into surface contact with end surfaces of each fillet.

5. The joint structure of the steel H-shapes according to claim 1, wherein each of the upper surface and the lower surface of the steel bearing plate comes into surface contact with a portion of the end surface of each flange over

an entire length of the flange in a width direction.

6. The joint structure of the steel H-shapes according to claim 1, further comprising:

an inner surface side backing plate which is attached to an inner surface of each flange and the weld metal.

7. The joint structure of the steel H-shapes according to claim 6, wherein an R portion which comes into surface contact with a surface of each fillet and a convex part which comes into surface contact with a surface of the steel bearing plate are formed on the inner surface side backing plate.

8. The joint structure of the steel H-shapes according to claim 6, wherein an R portion which comes into surface contact with a surface of each fillet and a concave part into which the steel bearing plate is fitted are formed on the inner surface side backing plate.

9. The joint structure of the steel H-shapes according to claim 1, further comprising:

an outer surface side backing plate which is attached to an outer surface of each flange and the weld metal.

10. A joining method of steel H-shapes for joining flat end surfaces of a pair of steel H-shapes each having a web, flanges, and fillets to each other, the method comprising:

disposing a steel bearing plate between end surfaces of the webs such that an upper surface and a lower surface of the steel bearing plate come into surface contact with an entire end surface of the webs; and

performing electroslog welding or electrogas arc welding on end surfaces of the flanges in a state where a gap formed between the end surfaces of the flanges is closed.