

TITLE OF THE INVENTION

Coupling Method and Coupling Block Used in Timbering for Sheathing

BACKGROUND OF THE INVENTION

This invention relates to a coupling method and a coupling block used in the timbering for a sheathing which is built to prevent collapse of earth and sand around an excavation dug using the open-cut method.

The object of the invention is to provide a coupling method and a coupling block which dispense with bolts for connecting shores, wales and angle braces that constitute the timbering for sheathing, or more specifically to provide a coupling method and a coupling block that make use the action of wedges.

When the ground is cut into deepy for setting the bases of a building or for a basement, sheathing is employed to prevent collapse of the earth and sand around the excavation. Timbering for sheathing, as shown in Fig.11, comprises sheathing walls (a), wales (b) that support the walls from the inside, angle braces (c) and shores (d). In constructing timbering for sheathing, the coupling between wales (b), angle braces (c), and shores (c) is indispensable.

The types of coupling used in timbering for sheathing are as follows:

- (1) Coupling between shores (See "e" of Fig.11)
- (2) Coupling between wales (See "f" of Fig.11)
- (3) Coupling between a shore and an angle brace (See "g" of

Fig.11)

(4) Coupling between a shore and a wale (See "h" of Fig.11)

(5) Coupling between an angle brace and a wale (See "i" of Fig.11)

Usually when the method described in "i" mentioned above is used, that is, the coupling between shores (H-shaped steel), it is effected by fastening steel plates welded at the end surfaces of said shores with bolts and nuts and further by fastening with nuts and bolts a cover plate applied to the flanges of the H-shaped steel. The coupling (2) of wales are carried out in a similar way since H-shaped steel is also used as wales.

The coupling (3) between a shore and an angle piece mentioned above, is carried out using an angle receiver piece and fastening it with nuts and bolts. The coupling (5) between an angle brace and a wale is effected in a manner similar to (3) described above.

The coupling (4) between a shore and a wale is carried out by attaching a seat piece on which the shore is rested and by clamping the wale and shore with nuts and bolts.

In all of the coupling types (1)-(5) described above, the method by which many bolts are used for clamping is adopted to enhance reliability. This method, however, takes much labor and time for coupling members that constitute the timbering; the unfastening of the nuts and bolts for disassembling the timbering after completion of the work also takes almost the same amount of labor and time as the construction. Moreover, this

nuts and bolts method involves costs for welding plates on H-shaped steel and opening bolt holes.

SUMMARY OF THE INVENTION

The coupling block according to the present invention consists of at least two sockets and wedges. Each socket is provided with a gutter-shaped hollow portion formed by a bottom plate and side walls to receive a member of timbering, and longitudinally extending parallel grooves for a wedge formed in said side walls. The two or more sockets are fixed together into one piece. The wedge engages with the grooves on both edges and is placed within.

As the ends of H-shaped steel beams used as wales, angle braces and shores are fitted into the hollows of the sockets of the coupling blocks according to the present invention, and the wedges are forced into the grooves for wedges, the H-shaped steel beams are strongly forced against the bottom plates of the socket by the wedge action and fixed there, achieving the coupling objective. By coupling two H-shaped steel beams using the coupling block with the two sockets integrally fixed together, the coupling of timbering members for sheathing can be achieved. If, for example, a coupling block consists of two sockets fixed together linearly back to back is used, two shores, or two wales, or two angle braces can be coupled linearly. If, on the other hand, a coupling block consists of two sockets that are fixed together at an angle, it can be used for coupling a shore and an angle brace, and so on. If the bottom surface of the wedges is flat, the height from the bottom surface of the sockets to the

lower edges of the grooves for wedges is reduced to less than the height of the H-shaped steel; if the wedge bottom surface has a convex portion, the height is further reduced by the height of the convex portion.

Another coupling block according to the present invention comprises, besides a socket and a wedge, a clamp and wedges for clamp. The clamp has a gutter wherein the flange of the H-shaped steel is fitted. On both of the side walls of said gutter grooves are formed for the wedges. The clamp is fixed to the socket to form an integral piece. Each of the wedges for the clamp preferably has a U-shaped base slidable on a flange of H-shaped steel fitted into it, and a wedge portion extending from the base. The wedge portion is forced into the grooves for the wedge and exerts a wedge action.

In the case of this coupling block, therefore, since the block is mounted on an H-shaped steel beam used as a wale in such a manner that the flange of said H-shaped steel beam tightly contacts the bottom surface of the gutter of the coupling block and the wedge portions of the wedges for the clamp are forced into the grooves for the wedges with the edges of the flanges of the H-shaped steel beam fitted in the U-shaped grooves, then by a wedge action the clamp and the integral socket are firmly fixed to the H-shaped steel beam at a predetermined position. Then one end of a shore, for example, is attached to the socket. Also in this type of coupling block, if the bottom surface of the wedges is flat, the distance from the bottom surface of the clamp to the lower edges of the grooves for the wedges is slightly less than the thickness of the flanges of H-shaped steel; if the bottom

surface of the wedges has a convex portion, the distance will be further reduced by the height of the convex portion. Using this coupling block, a wale and a shore or a wale and an angle brace can be effected.

As seen from the above, according to the present invention, all the fastening work of bolts and nuts for coupling a pair of shores, wales, a shore and an angle brace, or a wale and an angle brace, which constitute the timbering for sheathing becomes unnecessary, greatly simplifying the coupling work, enhancing efficiency and reducing the construction time. Further, the work of welding plates on the ends of the H-shaped steel beams and opening bolt holes are also dispensed with, reducing the costs of preparation.

The objectives and effects of the present invention will be apparent from the ensuing description of its embodiments together with the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig.1 is a diagonal view showing a coupling block which is the first embodiment of the present invention in a disassembled condition before use;

Fig.2 is diagonal view showing a pair of wales and a pair of shores each coupled together with the coupling block;

Fig.3 is a front view of the socket portion of the coupling block;

Fig.4 A-C show the process of coupling the H-shaped steel beams, in steps from start to completion;

Fig.5 is a diagonal view of another coupling block which

is the second embodiment of the invention in a disassembled condition before use;

Fig.6 is a diagonal view showing a shore and an angle brace coupled with the coupling block;

Fig.7 is a diagonal view of further coupling blocks which are the third and fourth embodiments of the present invention in a disassembled condition before use;

Fig.8 is a diagonal view of the coupling block of the third embodiment shown in relation to an H-shaped steel beam;

Fig.9 A-C show in steps a process of mounting the coupling block on an H-shaped steel beam at a predetermined position;

Fig.10 is a diagonal view of an angle brace and a wale coupled at a corner of a timbering with a coupling block which is the fifth embodiment of the present invention; and,

Fig.11 is an diagonal view illustrating a construction of a timbering for sheathing.

EMBODIMENT

In the following, embodiments of the present invention will be described.

Fig.1 shows a coupling block 20 that is the first embodiment of the present invention in a state just before use, and Fig.2 shows shores 10, angle braces 11 and wales 12 all made of H-shaped steel that constitute a timbering in a coupled position with the coupling blocks 20. The coupling block 20 comprises a body 26 and wedges 42. The body 26 consists of a pair of sockets 32,32 which are made from cast steel by casting

or by welding metal pieces and are attached together back to back into an integral piece with a partition wall 41 between. The two sockets 32,32 are provided with gutter-shaped hollows 34 into each of which an end of an H-shaped steel beam is inserted. The numeral 36 in the drawing designates the bottom surface of said hollow 34, while 38 designates the side surfaces. In the upper portions of the side surfaces a pair of grooves 40 for the are formed axially in symmetric opposite positions. The lower side of each groove 40 is parallel with said bottom surface, whereas the upper side has an upward slope toward the entrance of the hollow 34.

The wedge 42 consists of a base 46 and a one-side-tapered plate tapered on one side 44. On either side of the base 46 a U-shaped cut 48 is provided that receives a corresponding side wall of the socket, and on the center line of the wedge a bolt 50 is vertically provided a bolt 50 for preventing the loosening of the wedge. As shown in Fig.3 and 4A, when the bottom surface of the wedge 42 is flat, the height $h-1$ from the bottom surface 38 of the hollow 34 to the lower side 40a of the groove 40 is slightly lower than the height $h-2$ of the H-shaped steel beam 10.

If the H-shaped steel beams 10 used as shores are coupled with the coupling block 20, the H-shaped steel beams 10 are placed in front of the hollows 34 axially opposing each other as shown in Fig.4 A-C. The body 26 of the coupling block 20 is applied to the H-shaped steel beam 10 from below, the front end of the H-shaped steel beam 10 is lead into the hollow 34, and the lower flanges 10a of the H-shaped steel beam 10 are forced against the bottom surfaces 36 (Fig.4B). Then, the both edges of

the tapered plate 44 for each wedge 42 are forced into the grooves 40 for the wedge (Fig.4C), and the bolt 50 is fastened to fix the wedge 42 after both walls of the socket are received in the cuts 48,48 to prevent the widening of the entrance opening of the hollow 34. In this way, the H-shaped steel beam 10 and the body 26 are coupled and thus the two H-shaped steel beams 10,10 can be linearly coupled together with the coupling block 20. The arrow X in Fig.2 designates the coupling of a pair of shores 10, and similarly, the arrows Y and Z designate the couplings for a pair of wales 11 and a pair of angle braces 12, respectively.

The disassembling and removal of a timbering for sheathing can be easily carried out in the reverse order beginning with the loosening of the bolts 50, and the removal of the wedges 42.

THE SECOND EMBODIMENT

Next, Fig.5 shows another coupling block 22 which is the second embodiment of the present invention, and Fig.6 shows an example of the coupling of a shore 10 and an angle brace 11 with the coupling block 22. The coupling block 22 of this embodiment also consists of a body 28 and wedges 42. The body 28 is made from, for example, cast steel formed by casting and is an integral piece consisting of two sockets 32,32 attached together back to back as in the first embodiment and two side sockets 32', 32' which are diagonally attached. In the same way as in the first embodiment, in the upper portion of each of the sockets 32, 32' a pair of axially extending grooves 40 are provided for the wedge symmetrically opposing each other. The structure of the

wedge 42 is also the same as that of the first embodiment. Fig.6 shows a coupled condition wherein a pair of shores 10 are coupled with the two sockets 32,32 attached together back to back and an angle brace 11 is coupled to the side socket 32'. The coupling between the H-shaped steel beams 10,11 and the sockets 32,32', respectively, is carried out in the same procedure as described for the first embodiment. The numeral 52 in Fig.6 designates a metal piece packed to the far end of the hollow for adjusting the length of a shore.

THE THIRD EMBODIMENT

Fig.7 shows a coupling block 24 that couples a wale 12 and a shore 10 and a coupling block 25 that couples a wale 12 and an angle brace 11. The coupling block 24 that couples the wale 12 and the shore 10 and the coupling block 25 that couples the wale 12 and an angle brace 11 have almost the same structures and only differ in that while the socket 32 and the clamp 52 constituting the body 36 of the coupling block 24 are attached at a right angle to each other since the wale 12 and the shore 10 are orthogonal, the socket 32 and the clamp 54 constituting the body 28 are attached together at an angle of about 45 degrees since an angle brace usually forms the angle of about 45 degrees with a wale 12. In the following, therefore, the coupling block 24 will be mainly described. The coupling block 24 is comprised of the body 30, a wedge 42 and four wedges 64 for a clamp. The body 30 consists of the socket 32 having the same structure as described with the first embodiment and the clamp 54 that is to be mounted on a wale 12, attached together back to back into an

integral piece. The clamp 54 has a gutter 56 that is of a shape of a shallow channel and holds inside the inner flange of the H-shaped steel beam 12 which is used as a wale. The bottom surface 58 of said gutter 56 is perpendicular to the axis of the socket 32. The width $w-1$ of the entrance opening of the gutter 56 is a little wider than the width $w-2$ of the H-shaped steel beam 12 used as a wale (Fig.8). In both of the side walls 60,60 that define the gutter 56 for the H-shaped steel beam grooves 62,62 are provided for the wedge that oppose each other and extend axially. Of the two side surfaces that define the groove 62, the surface 62a that is nearer to the bottom surface 58 is formed parallel to the bottom surface 58, whereas the surface 62b opposing the surface 62a extends from the midpoint of the groove 62 in the axial direction to both ends with an inclination to broaden the groove 62 toward the ends. The distance $d-1$ between the surface 62a and the bottom surface 58 is slightly reduced to less than the thickness $d-2$ of the flange of the H-shaped steel beam 12 (Fig.9A). The base 66 of the wedge for the clamp 64 has a U-shaped section and is made by bending a steel strip. The distance $d-3$ between the two sides of said base 66 is slightly greater than the thickness $d-2$ of the flange of the H-shape steel beam and the base can be slid along the flange of the H-shaped beam. From the base 66 a wedge portion 68 extends in one direction and on the base 66 a lock bolt 70 is provided vertically to prevent loosening. The process and procedure to couple a shore 10 (H-shaped steel beam) by fitting one end of the shore in the hollow 34 formed in the socket 32 of this coupling block 24 and by forcing the wedge 42 into engagement are the same

as the first and the second embodiments described above. The procedure to mount the clamp 54 on the inner flange of a wale 12 and to fix it there is as illustrated in Fig.9 A-C. First, the gutter 56 for the H-shaped steel beam is fitted on the inner flange of the wale 12 at a predetermined position and in such a manner that the inner flange contacts tightly with the bottom surface 58. Then the wedge portion 68 is firmly forced into the grooves 62 as the base 66 of the wedge 64 for the clamp is fitted on the edge of the H-shaped steel beam 12, and is fixed in this condition by fastening the lock bolt 70. Four of the wedges 64, attached two by two on each of the upper and lower edges of the flange of the H-shaped steel beam 12, sandwich the clamp 54 from both sides and are fixed with corresponding bolts 70. In this manner, the body 30, including the clamp 54, is fixed very firmly to the wale 12. After this, as the shore 10 is coupled to the hollow 34 formed in the socket 32 of the body 30, the coupling of the shore 10 and the wale 12 by means of the coupling block 24 is effected. The coupling of a wale 12 and an angle brace 11 can be effected by the same process.

THE FOURTH EMBODIMENT

Fig.10 shows two wales 12,12, that are arranged to extend in grade separation, that is, one over the other, and an angle brace 11, all coupled together in a corner with coupling blocks 26 of still another embodiment. The coupling block 26 of this embodiment has substantially the same structure as the coupling block 25 shown in Fig.7, the only difference being that in the coupling block 26, the clamp and the socket 32 are integrally

connected in such a manner as to absorb the difference of levels of the two wales 12,12. The process of coupling wherein the gutters for the H-shaped steel of the clamps 54 are fitted in tight contact on the inner flanges of the wales 12,12, the four wedges 64, two on either side, are forced into the grooves and fixed there with lock bolts, and each end of the angle brace 11 is fitted in the socket 32 and fixed by forcing the wedge 42 into the grooves 40, as in the other embodiments.

The above is the description of the representative embodiments, and it should be added here that the invention is not restricted to the contents of the embodiments but includes the applications and designs which those engineers skilled in the art usually can make based on the technical thoughts of the present invention.



WHAT IS CLAIMED IS:

1. A coupling method of timbering members for sheathing, comprising preparation of a metal body made by attaching integrally at least two sockets provided with hollows wherein ends of a wale, a shore or an angle brace to be coupled are fitted and wedges that are forced into grooves provided axially on the side surfaces defining said hollows of said sockets, placing ends of a wale, a shore or an angle brace in said hollows, and forcing said wedges into said grooves, thereby coupling firmly said wale, shore or angle brace with said body by wedge action.
2. A method to couple a wale and a shore or a wale and an angle brace that cross each other at a right angle or diagonally at an angle for a timbering for sheathing, comprising: preparation of a metal body made by integrally attaching a clamp having a gutter to be mounted on a flange of an H-shaped steel and a socket provided with a gutter-shaped hollow wherein one end of a shore or an angle brace is fitted, a wedge that is forced into grooves for a wedge formed axially in both side surfaces defining said hollow, and wedges for clamping that are forced into grooves for a wedge formed in both side surfaces defining said gutter, mounting said gutter on a flange of an H-shaped steel in tight contact, forcing said wedges for clamping into said grooves for wedging of said gutter for H-shaped steel to fix said clamp firmly to said flange, fitting one end of said angle brace in said hollow of said socket, and forcing said wedges into said grooves for wedging of said socket for coupling.



3. A coupling method of timbering member sheathing as claimed in Claim 1, characterized in that each of said wedges is provided with a means to prevent widening of the entrance of said hollow by receiving both side walls of said socket as said wedge is forced into said grooves for wedge, and a means to prevent loosening of said wedge by fixing condition thereof through fastening of a lock bolt.

4. A coupling block for timbering members for sheathing, comprising a body made by integrally attaching at least two sockets in desired directions of coupling and wedges, each of said sockets which are at least two in quantity being provided with a hollow which has at least a bottom and two side surfaces to receive a timbering member, characterized in that axially extending grooves for wedge are formed symmetrically opposite to each other on said two side surfaces of said hollow, and that each of said wedges is forced into engagement through insertion of the edges on both sides thereof into said grooves for wedging of said hollow.

5. A coupling block for timbering members for sheathing, comprising a body made by integrally attaching at least one socket and a clamp in desired directions, wedges and wedges for clamp, said socket being provided with a hollow which has at least a bottom and two side surfaces to receive a timbering member, characterized in that axially extending grooves for wedge are formed symmetrically opposite to each other on said two side



surfaces of said hollow, that said wedge is made movable with side edges thereof fitted in said grooves for wedging of said hollow, and that said wedge for clamp is provided with a wedge portion that can be inserted in said grooves for wedging of said gutter for H-shaped steel.

6. A coupling block for timbering members for sheathing as claimed in Claim 4 characterized in that on both sides of the base of said wedge are provided U-shaped cuts that receive the side walls of said socket and that a vertical lock bolt is provided on said wedge for prevention of loosening of said wedge.

7. A coupling block for timbering members for sheathing as claimed in Claim 5 characterized in that said wedge for clamp comprises a U-shaped base which is fitted onto the edge of H-shaped steel used as a wale and a wedge portion that extends on one side from said base and that a vertical lock bolt is provided on said base for prevention of loosening of said wedge.