SHEET PILING CONNECTORS


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References Cited

UNITED STATES PATENTS

3,302,412 2/1967 Hunsucker 61/60
968,450 8/1910 Conkling et al. 61/62

FOREIGN PATENTS OR APPLICATIONS

894,627 3/1944 France 61/61

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ABSTRACT

An extruded steel connector for connecting three sheet pileings has three spaced apart appendages radiating from a solid core. The angle between the appendages may vary, but should not be less than 30°. Each appendage includes a C-arm, spaced from a T-arm to form an oval opening having a restricted passage to the outer periphery of the connector. The T-arms of the pileings are received one in each oval opening. The core has a concave arcuate outer portion between adjacent appendages. The distance between the bottoms of adjacent openings is a maximum of four times the depth of the openings as measured from the outside of the connector.

3 Claims, 3 Drawing Figures
FIG. 3.
The invention relates to sheet piling connectors and more particularly to extruded steel connectors. In making foundations for permanent structures in water, cofferdams consisting of interconnecting cells are used to temporarily exclude water from the site. Such cofferdams are also frequently used as permanent dock walls or bulkheads because of construction and cost advantages over other types. One form of cofferdam consists of a series of large diameter circular or generally elliptical cells constructed of interlocking steel sheet piling and filled with sand, gravel or rock. In order to make the line of cells continuous, they are connected front and back by short walls of steel sheet piling with the space between the walls being filled with the same material as the main cells. The connecting piece between the circular cell and the arc is usually in the shape of a wye or tee. These wye or tee sections normally are made by welding or riveting a stem to the regular piling section. The stem is normally obtained by splitting a section of the regular piling. Connectors of this type are shown in United States Steel 1968 Catalogue on Steel Sheet Piling, particularly on pages 32, 33, 35 and 36. The pressure from the fill creates a hoop stress around the periphery of the cell which is resisted by the strength of the individual piling sections. An additional large and mostly indeterminate stress is applied at the connectors due to the pull on the stem caused by the fill inside the connecting arc previously referred to. In the present design the connector stem is placed at approximately a central position along the web of the main section. This location creates stresses that act as a bending force in the web area of the main section. In the welded wye or tee, the stresses created by the forces on the stem tend to separate the steel fibers and also to bend the pile in the web area. In the riveted tee or wye the holes punched in the main section for riveting tend to weaken its resistance to the hoop stresses and bending stresses referred to earlier. This tee or wye is also subject to the same dangerous bending stresses in the web area of the main section as the welded section. Thus, the fabricated connector is the weakest part of this type of cofferdam and is most frequently the point of failure in a cofferdam. In addition to these disadvantages the fabricated connector is expensive to make. It is therefore an object of my invention to provide extruded sheet piling connectors which are stronger and cheaper to make than the fabricated connectors.

This and other objects will be more apparent after referring to the following specification and attached drawings, in which:

FIG. 1 is a cross sectional view of the connector of my invention showing it connecting sheet piling;

FIG. 2 is a view, similar to FIG. 1, showing a second embodiment of my invention; and

FIG. 3 is a view, similar to FIG. 1, showing a third embodiment of my invention.

Referring more particularly to FIG. 1 of the drawings, reference numeral 2 indicates an extruded steel connector of my invention. Lengths of sheet piling 4 and 6 forming part of a usual cell are connected by the connector 2. A third length of sheet piling 8 is connected to the connector 2 and forms part of a connecting wall. Connector 2 includes a solid core 10 and three spaced apart appendages 12, 14 and 16 radiating from the core. The appendages 12, 14 and 16 include C-arms 12C, 14C and 16C and T-arms 12T, 14T and 16T spaced from their associated C-arms to form oval openings 12A, 14A and 16A, respectively. Restricted passages 12P, 14P and 16P lead from the openings 12A, 14A and 16A to the outer periphery of the connector. The lengths of sheet piling 4, 5 and 6 include T-arms 4T, 6T and 8T which are received in openings 12A, 14A and 16A in the usual manner. The core 10 has a concave arcuate outer portion 18 between the C-arms 12C and 14C; a concave arcuate outer portion 20 between T-arm 12T and C-arm 16C; and a concave arcuate outer portion 22 between T-arms 14T and 16T. These concave portions are necessary to reduce the weight of the connector, to eliminate stress areas and to facilitate extrusion of the connector. The distance between the bottoms of adjacent openings is a maximum of four times the depth D of said openings as measured from the outside of said connector. This reduces the weight of the connector to make it easier to handle, cheaper to extrude, and less likely to be damaged. The central load line 24 from pilings 4 and 6 are in alignment and pass through appendages 12 and 14. Central load line 26 from piling 8 passes through the appendage 16 and intersects the load line 24 at an angle 28 of 30°. In this embodiment the angle 28 ma be greater than, but not less than 40°. It will be seen that the longitudinal center of mass of the connector is displaced from the intersection of the load lines 24 and 26. This results in better load distribution and enables the weight of the connector to be less.

Referring now to FIG. 2 of the drawings reference numeral 29 indicates a second connector of my invention. Lengths of sheet piling 30 and 32 forming part of a cell are connected by the connector 29. A third length of sheet piling 34 is connected to the connector 28 and forms part of a connecting wall. Connector 29 includes a solid core 36 and three spaced apart appendages 38, 40 and 42 similar to the appendages of the first embodiment with oval openings 38A, 40A and 42A for receiving the T-arms of the sheet piling 30, 32 and 34. The core 36 has a concave arcuate outer portion 44 between T-arms 38T and 40T, a concave arcuate outer portion 46 between C-arms 40C and 42C, and a concave arcuate outer portion 48 between C-arm 38C and T-arm 42T. The distance between the bottoms of adjacent openings is a maximum of four times the depth of the opening as measured from the outside of the connector as in the first embodiment. The central load line 50 from pilings 30 and 32 are in alignment and pass through appendages 38 and 40. Central load line 52 from piling 34 passes through the appendage 42 and intersects the load line 50 at an angle of 90°. As in the first embodiment the longitudinal center of the pass of the connector is displaced from the intersection of the load lines 50 and 52.

Referring now to FIG. 3 reference numeral 54 indicates a third connector of my invention. Lengths of sheet piling 56, 58 and 60 are connected by the connector 54. Preferably two of these lengths of sheet piling form part of a cell with the third length forming part of a connecting wall. Connector 54 includes a solid extruded core 62 and three spaced apart appendages 64, 66 and 68, similar to the appendages of the other two embodiments and including openings 64A, 66A and 68A.
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The core 62 has a concave arcuate outer portion 70 between C-arms 64C and 66C, a concave arcuate outer portion 72 between T-arms 66T and 68T, and a concave outer portion 74 between T-arm 64T and C-arm 68C. Also, as in the first embodiment the distance between the bottoms of adjacent openings is the maximum of four times the depth of the openings as measured from the outside of the connector. Central load line 76 from piling 56 passes through the appendage 64, central load line 78 from piling 58 passes through appendage 66, and central load line 80 from piling 60 passes through appendage 68 with the three load lines intersecting at point 82. The load lines are spaced 120° apart and their intersection is displaced from the longitudinal center of the mass of the connector.

The three embodiments are necessary to take care of those installations which most commonly occur with the connectors of FIGS. 2 and 3 having substantially all the advantages of the connector of FIG. 1. In order to enable the invention to be easier to visualize the drawings have been made three-fourths full size to scale. It will be apparent from the drawings that each sheet piling has a C-arm spaced from its T-arm to provide an oval opening having a restricted passageway to its outer periphery. The width and depth of the oval opening in the piling is substantially greater than that of the head of the connector T-arm and the width and depth of the oval opening in the connector is substantially greater than that of the head of the piling T-arm. Also the width of the restricted openings of the connector and piling are substantially greater than the supporting legs of the mating piling T-head and the mating connector T-head, respectively.

While three embodiments of my invention have been shown and described, it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. An extruded connector for connecting three sheet pilings each having a T-arm and a C-arm spaced from the T-arm to form an oval opening having a restricted passage to the outer periphery of said sheet piling; said connector comprising a solid core, and three spaced apart appendages radiating from said core, each appendage including a C-arm and a T-arm spaced from said C-arm to form an oval opening having a restricted passage to the outer periphery of said connector, each of said oval openings having a width and depth sufficient to receive the T-arms of said pilings, the width and depth of said connector oval opening being substantially greater than the head of said piling T-arm and the width of said restricted passage being substantially greater than the supporting leg of said piling T-arm, said core having a concave arcuate outer portion between adjacent appendages the distance between the bottoms of adjacent openings being a maximum of four times the depth of said openings as measured from the outside of said connector, the head of each T-arm extending substantially the same distance from each side of its leg, the width and depth of the piling oval opening being substantially greater than that of the head of said connector T-arm and the width of said piling restricted opening being substantially greater than the supporting leg of said connector T-arm, each head of said connector T-arm being adapted to bear against the C-arm and one side of the head of the associated piling T-arm and the C-arm of said connector being adapted to bear against the other side of the head of the associated piling T-arm, the longitudinal center of mass of said connector being displaced from the intersection of the load lines from the pilings being connected.

2. An extruded connector according to claim 1 in which the central load lines from two of said pilings through two of said appendages are in alignment and the central load line from the third piling through the third appendage is at an acute angle thereto so that the third appendage is closer to one of said two appendages than to the other of said two appendages, the C-arm of one of said closely spaced appendages being adjacent the T-arm of the other closely spaced appendage.

3. An extruded connector according to claim 1 in which the load lines are arranged 120° apart, the T-arms of two adjacent appendages are adjacent each other, the T-arm of of the other appendage being adjacent the C-arm of one of the said adjacent appendages and its C-arm being adjacent the C-arm of the other of said adjacent appendages.

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