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TITLE: PILE DRIVINGTECHNICAL FIELD

The invention relates to pile driving, and more particularly, but not exclusively, to underwater pile driving, e.g. for stabbing piles directly into the seabed.

10 BACKGROUND ART

It is known to provide a guide for aligning a pile with the surface of a substrate into which the pile is to be driven and to provide stability for a piling hammer. Particularly when piling underwater there is the problem
15 that after the pile has been introduced into the seabed or the like, the guide must be removed to allow the pile to be driven into its final position. This guide removal is time consuming and thus expensive.

It is an object of the invention to provide a
20 stabilising guide for a pile which can be moved out of the way after a pile has first been established in its substrate to enable the pile driving to continue to drive the pile into its final position without any need to stop the driving to remove the guide.

25 DISCLOSURE OF THE INVENTION

According to a first aspect of the invention a pile guide comprises a guide member adapted to be supported on a substrate into which the pile is to be driven, means

mounting the guide member in an operative position in which it can support a pile and hammer and permitting movement of the guide member into an inoperative position in which the guide member is remote from the pile, and
5 latch means for holding the guide member in its operative position, the latch means co-operating with means on or associated with the pile to unlatch the guide member after the pile has been inserted to a predetermined extent to allow the guide member to move to its inoperative
10 position.

The guide member may comprise a pair of generally semi-cylindrical members which together form a tubular member for enclosing the pile.

The guide member may be hinged on the mounting means.
15 Thus the pair of semi-cylindrical members may be hinged on the mounting means at their bottom ends so that they move away from the pile in opposed directions. Means for moving the guide member into its inoperative position, e.g. spring means, may be provided but preferably the
20 guide member is urged into its inoperative position by gravity.

The pile guide may comprise lifting means which also causes the pile guide member to assume its operative position.

25 The means on the pile to unlatch the guide member may comprise a detent member attached (e.g. welded) to the pile.

The mounting means may comprise a base frame adapted

to rest on the substrate (e.g. seabed) to support the guide member in position. The base frame may surround the guide member. The base frame may, however, be formed with an aperture or slot extending therethrough to facilitate removal of the pile guide from rigging or a tether attached to a pile driven into the seabed. The guide member may have groove means for receiving rigging or a tether attached to a pile passing through the guide member.

10 In accordance with a second aspect of the present invention, there is provided a method of driving a pile into a substrate, comprising: providing a pile guide in accordance with the first aspect of the present invention; providing means on or associated with the pile to unlatch
15 the guide member after the pile has been inserted to a predetermined extent to move the guide member to its inoperative position; supporting the pile with the guide member in the operative position; and driving the pile into the substrate to an extent beyond the predetermined
20 extent without removing the pile guide.

In accordance with a further aspect of the present invention, there is provided a pile guide comprising a guide member adapted to be supported on substrate into which a pile is to be driven, characterised in that the
25 guide member comprises at least two parts, and by comprising means for moving the at least two parts between an operative position for supporting the pile and hammer and an inoperative position remote from the pile when the

pile has been driven into the substrate to a predetermined extent. In the inoperative position, there is sufficient clearance to avoid the hammer fouling the at least two parts when the pile is driven beyond the predetermined 5 extent, without the need to remove the pile guide itself.

The pile guide may further comprise a means for retaining the at least two parts in the operative position, the at least two parts having biasing means which urge the at least two parts into the inoperative 10 position when the retaining means is disengaged. The retaining means may comprise latch means for latching the at least two parts together in the operative position, the latching means co-operating with trigger means on or associated with the pile to unlatch the at least two parts 15 when the pile has been driven into the substrate to the predetermined extent. The biasing means may comprise counter weights which act under gravity.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the invention is illustrated, by way 20 of example, in the accompanying drawings, in which:-

Figure 1 is a side elevation of a pile guide for underwater pile driving shown in its operative condition;

Figure 2 is a side view generally similar to that of Figure 1 showing the pile guide in its inoperative 25 condition;

Figure 3 comprises respective scrap plan and side views of a latch mechanism, and

Figure 4 is a plan view of a base frame for the pile

guide of Figure 1.

MODE OF CARRYING OUT THE INVENTION

In the drawings a pile guide (1) comprises a base frame (2) adapted to rest on the seabed (9) to support the guide in position. The guide (1) has an open-ended generally vertical tubular guide member (3) supported on the base frame (2) and adapted slidably to receive a pile (7) to be driven into the seabed (9) by means of a hammer (6) connected to rigging (23), see Figure 2. The upper end (5) of the member (4) is flared outwardly to form a guide cone to facilitate entry of a pile (7) into the guide.

The tubular guide member (3) comprises two similar semi-cylindrical parts (4), which as shown in Figure 1 are held together by a latch (14), more fully described below, and by alignment plates (13). Each part (4) is pivotally mounted at points (12) on the base frame (2) for movement between the working or closed position shown in Figure 1 and the inoperative or open position shown in Figure 2. The respective parts (4) are mounted on counterweighted arms (10,11) which are pivoted on the base frame (2) such that the arms (10,11) are biased under gravity into the positions shown in Figure 2.

Braces (16) connect the outer ends of the arms (10,11) and upper portions of the parts (4) in the interests of rigidity.

As shown in Figure 3, each latch (14) comprises a spring-loaded plate (20) secured to one part (4) and

formed with an aperture (24) which receives a lock bar (22) secured to the other part (4). The plate (20) is formed with an outwardly flared end (25) to guide the lock bar (22) into the aperture (24) in the plate (20). The latch (14) is disengaged by downward movement of the pile (7) as it is driven into the seabed (9). The pile is provided with a latch trigger or detent (8) which engages a latch plate (18) pivoted on a part (4) and which is rotated by continued downward movement of the trigger (8) to push the plate (20) outwardly so that the bar (22) is released from the aperture (24). (Spacers (21) are provided on the inner periphery of the parts (4) to centre piles which have a smaller diameter than the guide member (3).) The parts (4) then fall under gravity into the position shown in Figure 2.

In this way it is possible to continue driving the pile into the seabed without the need for removing the guide from the pile or the hammer from the pile as is necessary with conventional pile guide frames, since the two halves or parts (4) of the guide are moved clear of the pile and the driving hammer (6).

The pile guide is moved back into its working condition by operation of slings or cables (17) arranged to lift the pile guide, the slings (17) being connected to lifting eyes (15) on the outer ends of the arms (10,11), the weight of the pile guide being sufficient so that the arms are rotated into the position shown in Figure 1 during such lifting. Of course, during driving the slings

(17) are slack to allow the frame (2) to sit fully on the seabed.

Figure 4 shows the base frame (2) in plane view, in which it has a substantially rectangular footprint (made up of mud mats M) with a centrally placed aperture (30) through which the pile (7) is guided. (In figure 4, the guide member (3) and counterweight assembly have been omitted for the sake of clarity.) The base frame thus surrounds the pile. It will be seen, however, that the base frame is formed with an aperture or slot (31) extending through the frame from its exterior to the central aperture (30) and through which a tether or rigging (32) fixed to the pile (7) can be passed to disengage the pile guide (1) from the pile.

15 INDUSTRIAL APPLICABILITY

The invention thus provides a simple mechanism which avoids the downtime required by conventional guides in removing the guide frame or piling hammer part way through the pile driving process.

CLAIMS

1. A pile guide (1) comprising a guide member (3) adapted to be supported on a substrate into which a pile is to be driven, means (2), (10,11) mounting the guide member in an operative position for supporting the pile and hammer, the mounting means permitting movement of the guide member into an inoperative position in which the guide member is remote from the pile, and latch means (14) for holding the guide member in its operative position, 10 the latch means co-operating with means on or associated with the pile to unlatch the guide member after the pile has been inserted to a predetermined extent to allow the guide member to move to its inoperative position.
2. A pile guide (1) according to claim 1, in which the 15 guide member (3) comprises at least two parts (4) which together form a hollow member for enclosing the pile.
3. A pile guide (1) according to claim 2, in which the at least two parts (4) are semi-cylindrical, the hollow member having a circular cross-section.
- 20 4. A pile guide (1) according to any one of claims 1 to 3, in which the guide member (3) is hinged on the mounting means (2).
5. A pile guide (1) according to claim 4 when appendant to claim 2 or 3, in which the at least two parts (4) are 25 hinged at their bottom ends (12) so that they are pivotable away from the pile.
6. A pile guide (1) according to any one of the preceding claims, in which the guide means (3) is urged



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into its inoperative position by gravity.

7. A pile guide (1) according to any one of the preceding claims, further comprising lifting means (15,17) which also causes the guide member (3) to assume its operative position when lifted.

8. A pile guide (1) according to any preceding claim, in which the mounting means comprises a base frame (2) adapted to rest on the substrate.

9. A pile guide (1) according to claim 8, in which the base frame (2) surrounds or substantially surrounds the guide member (3).

10. A pile guide (1) according to claim 9, in which the base frame (2) is provided with an aperture (31) extending from the guide member (3) to the base from periphery, the aperture facilitating removal of the pile guide from rigging or a tether attached to a pile driven into the substrate.

11. A pile guide (1) according to claim 10, in which the guide member (3) is provided with groove means for receiving rigging or a tether attached to a pile passing through the guide member.

12. A method of driving a pile (7) into a substrate (9), comprising: providing a pile guide (1) comprising a guide member (3) adapted to be supported on the substrate into which the pile is to be driven, means mounting the guide member in an operative position for supporting the pile and hammer, the mounting means permitting movement of the guide member into an in-operative position in which the

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- guide member is remote from the pile, and latch means for holding the guide member in its operative position; providing means on or associated with the pile to unlatch the guide member after the pile has been inserted to a
5 predetermined extent to allow the guide member to move to its inoperative position; supporting the pile with the guide member in the operative position; and driving the pile into the substrate to an extent beyond the predetermined extent without removing the pile guide.
- 10 13. A method according to claim 12, in which the substrate is under water.
14. A method according to claim 12 or 13, in which the unlatching means provided comprises a detent member (8) attached to the pile (7).

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