In EP 2 980 328 A, an infiltration element is described. The infiltration element has a base to which hollow columns are joined.

A disadvantage of this infiltration element is that it has limited versatility in terms of deployment.

It is an object of the invention to provide a plastic infiltration unit that will address at least one of the above-mentioned problems.

In particular, it is an object of the present invention to provide a plastic infiltration unit which exhibits an improvement in its ability to withstand loads.

It is a further object of the present invention to provide a plastic infiltration unit which is versatile in terms of deployment.

In accordance with one aspect of the invention, there is provided a plastic infiltration unit comprising:

a deck extending in a plane, the deck having a first surface and a second surface, wherein the first surface is arranged to face in a first direction and the second surface is arranged to face in a second direction, wherein the second direction is different to the first direction,

at least two support structures which are each connected to the deck at the second surface and extend from the second surface,

wherein each of the at least two support structures include a proximal portion located in a proximal zone with respect to the deck and a distal portion located in a distal zone with respect to the deck, and a reception location located in the proximal zone,

wherein another identical plastic infiltration unit comprising at least two another support structures and the plastic infiltration unit can be placed in an interconnected condition, wherein, in the interconnected condition, the at least two another support structures contact the at least two reception locations, so that a load exerted on the plastic infiltration unit is transferred to the identical plastic infiltration unit, wherein each of the at least two support structures comprises a plurality of leg portions, so that in the interconnected condition a grouped set of leg portions has double the number of leg portions between two decks than for either the plastic infiltration unit or the identical plastic infiltration unit,

wherein at least one of the at least two support structures comprises a plurality of leg portions, each of the plurality of leg portions having a (imaginary) central longitudinal axis extending in the direction in which the at least two support structures extend, wherein the leg portions are arranged in a cluster around the (imaginary) central longitudinal axis.

In this way, a unit that can withstand more force, and has almost double strength, is achieved, since the support structures of the plastic infiltration unit are interconnected with the support structures of the another, so that, when deployed, the total number of support structures disposed between the deck of the plastic infiltration unit and the another plastic infiltration unit is double the number

of support structures that each infiltration unit has. This increase in strength greatly improves the versatility of the deployment options of the plastic infiltration unit, so that the plastic infiltration unit can be deployed in situations not only where water management is an issue, but in other situations where strength is required, for example, where it is envisaged that plastic infiltration units have a weight bearing function. For example, it has been found that the plastic infiltration units according to this aspect of the present invention, in an array, can be arranged to form a structure to bear loads such as those of vehicles and other machinery. This greatly increases the versatility of the plastic infiltration unit in terms of deployment options and opens up new deployment opportunities, for example, weight bearing deployment opportunities where plastic infiltration units might not have been considered an option. Further, the plastic infiltration unit according to aspects of the present invention can be used for both water management and external weight bearing. In this way, the number of components required for a particular situation can be reduced. This simplifies installation and reduces installation time.

In further detail, in this way, by installing units inside each other in accordance with this aspect of the invention, the support structure surface area is enlarged two times that for a single plastic infiltration unit. As mentioned above, this increases the strength of the unit by two times. Further, the side strength is increased by two times because the interconnected structure has two decks to withstand force.

According to a further aspect of the invention, there is provided a system (an assembly) comprising at least two plastic infiltration units as described, the system including a first and a second plastic infiltration unit, wherein each plastic infiltration unit comprises:

a deck extending in a plane, the deck having a first and a second surface, wherein the first surface is arranged to face in a first direction and the second surface is arranged to face in a second direction, wherein the second direction is different, preferably opposite, to the first direction,

at least two support structures which are each connected to the deck at the second surface and extend from the second surface,

wherein each of the at least two support structures include a proximal portion located in a proximal zone with respect to the deck and a distal portion located in a distal zone with respect to the deck, and a reception location located in the proximal zone,

the first plastic infiltration and the second plastic infiltration unit can be placed in an interconnected condition, wherein, in the interconnected condition, the at least two support structures of the second plastic infiltration unit contact the at least two reception locations of the first plastic

infiltration unit, so that a load exerted on the first plastic infiltration unit is transferred to the second plastic infiltration unit.

In this way, the same advantages are achieved as those recited above for the plastic infiltration unit.

According to a yet further aspect, the plastic infiltration unit comprises:
a deck extending in a plane, the deck having a first surface and a second surface, wherein the first surface is arranged to face in a first direction and the second surface is arranged to face in a second direction, wherein the second direction is different to the first direction,
at least two pillar-like support structures which are each connected to the deck at the second surface and extend from the second surface,
wherein each of the at least two pillar-like support structures has a (imaginary) central longitudinal axis and includes at least two pillar-like supports,
wherein another identical plastic infiltration unit comprising at least two another pillar-like support structures and the plastic infiltration can be placed in an interconnected condition, wherein, in the interconnected condition, the (imaginary) central longitudinal axes of the at least two pillar-like support structures and the at least two another pillar-like support structures are aligned.

In this way, the plastic infiltration unit and the another plastic infiltration unit can be interconnected in such a way that one plastic infiltration unit can be disposed on the deck of the another infiltration unit or the plastic infiltration unit can be interconnected in such a way that the plastic infiltration unit can be disposed so that the pillar-like support structures of the plastic infiltration unit are interleaved around the (imaginary) central longitudinal axis of the another identical plastic infiltration unit. In both arrangements, a force exerted in the direction of the (imaginary) central longitudinal axis is directed from the plastic infiltration unit to the another identical plastic infiltration unit. In this way, the versatility of the deployment of the plastic infiltration unit is increased.

A geotextile or geomembrane retention clip is disclosed.

A geotextile or geomembranes are known. They may be used to form a part of a filter or a barrier. Typically, they are deployed underground. Geotextiles or geomembranes can, for example, be used

together with an infiltration unit. When used with an infiltration unit, they can be arranged to cover at least a portion of the unit. It can be desirable to attach or secure the geotextile or geomembrane to the object, for example, an infiltration unit, but not limited respect. The inventors of the present invention have found that conventional techniques for attaching geotextiles and geomembranes suffer from drawbacks, such as they increase the overall installation time, do not attach the geotextile or geomembrane securely, and for example, when used with an infiltration unit, they can render more complex the installation of a two or three dimensional array of infiltration units. Further, due to the way in which the geotextile or geomembrane is attached, the infiltration units within the array may be less than ideally aligned with respect to one another, which will reduce the ability of the array to withstand forces (loads).

There is provided a geotextile or geomembrane retention clip for retaining a geotextile or a geomembrane on a plastic infiltration unit, the retention clip comprising: a deformable retaining hook which is deformable to allow the geotextile or geomembrane to be inserted under the deformable hook and to retain the geotextile or geomembrane once it has been inserted.

In this way, the geotextile or geomembrane can be easily attached to an object. Further, once attached it is securely retained on the object. In this way, the installation time of the geotextile or geomembrane is reduced and a geotextile or geomembrane is can be reliably attached.

A plastic side plate for installation on a plastic infiltration unit is also disclosed.

Plastic side plates are known. Plastic side plates may be used to enclose a plastic infiltration unit on one or more sides. Sometimes it is necessary for maintenance purposes or for connection purposes, or otherwise, to insert a pipe into an infiltration unit. Conventional techniques have drawbacks, such as additional components are required which may result in an increase in the overall installation time. Further, the accuracy with which a pipe can be inserted is low.

There is provided a plastic side plate for installation on a plastic infiltration unit, the plastic side plate comprising:

a main body,

an opening for receiving a pipe, and

a pipe stopper for limiting the extent to which the pipe is insertable into the plastic infiltration unit, wherein the pipe stopper is integrally formed in the plastic side plate.

In this way, the number of parts required in order to insert a pipe and the installation complexity is minimized. Further, in this way, the pipe is prevented from being inserted too far and thus interfering with other pipes etc.

There is provided a plastic side plate for installation on a plastic infiltration unit, the plastic side plate comprising:

a main body, wherein the main body comprises an opening,

and at least one cut-out for receiving at least one attachment part of a connection adapter to be attached to the plastic side plate, and at least one guide part, wherein the at least one cut-out and the at least one guide part are arranged in the vicinity of the opening so that the connection adapter is rotatably attachable to the plastic side plate.

In this way, a connector can be readily and reliably attached to the plastic infiltration unit.

A middle plate for a plastic infiltration unit is disclosed.

The infiltration elements described in EP 1 932 975 A and EP 2 980 328 A, for example, are limited to the arrangement in use, where one infiltration element is stacked on the base wall of another infiltration unit.

A middle plate makes it possible to arrange two infiltration units in such a way that the support structures of the infiltration units are directed towards one another rather being directed towards the base wall of the other infiltration device.

There is provided a middle plate for a plastic infiltration unit, the middle plate extending in a plane, the middle plate having a first surface and a second surface, wherein the first and second surfaces are different from one another, wherein the first surface comprises a plurality of first reception zones and the second surface comprises a plurality of second reception zones, wherein the first reception zones are configured to receive a first plurality of pillar-like support structures having a central axis of a first plastic infiltration unit and the second reception zones are configured to receive a second plurality of pillar-like support structures having a central axis of a second plastic infiltration unit, so that the central axes of the first and second plurality of pillar-like support structures are aligned.

In this way, two infiltration units can be arranged so that the vertical reduction for multilayer tanks is reduced.

There is provided a system (an assembly) comprising a middle plate according to the aspect described above and a first and a second plastic infiltration unit according to the aspects described above, wherein in an assembled state the second plastic infiltration unit is in an inverted configuration with respect to the first plastic infiltration unit and wherein the middle plate is disposed between the first and the second plastic infiltration unit.

The plastic infiltration unit of the present invention, due to its stackability results in a transport volume reduction. It has a lower carbon footprint. Further, it can be made from up to 100 % recycled plastics. As a result, it has improved sustainability.

The invention, and various embodiments thereof, will further be explained on the basis of examples, with reference made to the drawings, in which:

Fig. 1 shows a plastic infiltration unit according to an embodiment of the invention;

Claims

1 A plastic infiltration unit comprising:

a deck extending in a plane, the deck having a first surface and a second surface, wherein the first surface is arranged to face in a first direction and the second surface is arranged to face in a second direction, wherein the second direction is different to the first direction,

at least two support structures which are each connected to the deck at the second surface and extend from the second surface,

wherein each of the at least two support structures include a proximal portion located in a proximal zone with respect to the deck and a distal portion located in a distal zone with respect to the deck, and a reception location located in the proximal zone,

wherein another identical plastic infiltration unit comprising at least two another support structures and the plastic infiltration unit can be placed in an interconnected condition, wherein, in the interconnected condition, the at least two another support structures contact the at least two reception locations, so that a load exerted on the plastic infiltration unit is transferred to the identical plastic infiltration unit,

wherein each of the at least two support structures comprises a plurality of leg portions, so that in the interconnected condition a grouped set of leg portions has double the number of leg portions between two decks than for either the plastic infiltration unit or the identical plastic infiltration unit,

wherein at least one of the at least two support structures comprises a plurality of leg portions, each of the plurality of leg portions having a (imaginary) central longitudinal axis extending in the direction in which the at least two support structures extend, wherein the leg portions are arranged in a cluster around the (imaginary) central longitudinal axis.

2. The plastic infiltration unit according to claim 1, wherein the second direction is opposite to the first direction.

3. The plastic infiltration unit according to claim 1 or claim 2, wherein the support structures are pillar-like support structures.

4. The plastic infiltration unit according to any of claims 1 to 3, wherein each of the at least two support structures include an interaction structure located in the distal zone.

5. The plastic infiltration unit according to claim 1, wherein, in the interconnected condition, the interaction structures of the plastic infiltration unit are in contact with the reception location in the proximal zone of the identical plastic infiltration unit (and vice versa).

6. The plastic infiltration unit according to claim 4 or 5, wherein the interaction structure includes a foot portion of the pillar-like support structure and the reception location includes a recess, so that in the interconnected condition, the foot portion of the plastic infiltration unit is disposed in the recess of the identical plastic infiltration unit.

7. The plastic infiltration unit according to claim 6, wherein the recess is an opening in the deck which extends at least partially through the deck.

8. The plastic infiltration unit according to claim 7, wherein the recess is an opening in the deck which extends entirely through the deck.

9. The plastic infiltration unit according to any of claims 6 to 8, wherein the dimensions of the foot portion of the plastic infiltration unit match the dimensions of the reception location (recess)of the another identical plastic infiltration unit.

10. The plastic infiltration unit according to any of claims 6 to 9, wherein the foot portion includes at least one edge portion and the recess includes at least one edge portion, so that in the interconnected condition, the at least one edge of the foot portion of the plastic infiltration unit is in contact with at least one edge of the recess of the identical plastic infiltration unit, so that force is transferred between the plastic infiltration unit and the identical plastic infiltration unit (and vice versa).

11. The plastic infiltration unit according to any of claims 3 to 10, wherein the at least two pillar-like support structures comprise: a first pillar-like support structure and a second pillar-like support structure.

12. The plastic infiltration unit according to claim 11, wherein the at least one of the first and second pillar-like support structures includes a hollow leg portion which is configured to fit inside at least one of the first and second pillar-like support structures of the identical plastic infiltration unit in a nested arrangement.

13. The plastic infiltration unit according to claim 11 or 12, wherein the first and second pillar-like support structures are configured so that when one of the plastic infiltration unit and the identical plastic infiltration unit is rotated by 90 degrees and/or 180 degrees with respect to the other, the plastic infiltration unit is stackable on the deck of the identical plastic infiltration unit (and vice versa).

14. The plastic infiltration unit according to any of claims 11 to 13, wherein the first pillar-like support structure comprises a tapered, hollow leg portion and the second pillar-like support structure comprises a ring shaped leg portion, wherein the ring shaped leg portion has a receiving recess extending along the direction of the leg portion, so that in the interconnected condition, the tapered, hollow leg portion of the identical plastic infiltration unit is received by the recess of the identical plastic infiltration unit.

15. The plastic infiltration unit according to any preceding claim, wherein each cluster has its own (imaginary) central axis, respectively.

16. The plastic infiltration unit according to any preceding claim, wherein each cluster comprises 2 or more leg portions.

17. The plastic infiltration unit according to any preceding claim, wherein the leg portions are arranged equally spaced around the (imaginary) central longitudinal axis or unequally spaced around the (imaginary) central longitudinal axis.

18. The plastic infiltration unit according to any of claims 11 to 17, wherein at least one of the first and second pillar-like support structure comprises a plurality of leg portions arranged in a cluster around the (imaginary) central longitudinal axis extending in the direction in which the at least two pillar-like support structures extend.

19. The plastic infiltration unit according to any of claims 3 to 18, wherein the plastic infiltration unit is configured so that it can be put in a nested condition within an identical plastic infiltration unit, when the orientation of both infiltration units is the same (equal), so that each of the pillar-like support structures of the infiltration unit is aligned to fit inside the respective each pillar-like structure of the identical infiltration unit.

20. The plastic infiltration unit according to any of claims 14 to 19, wherein the plurality of leg portions is equal to two or more leg portions.

21. The plastic infiltration unit according to any preceding claim, wherein each of the at least two support structures define, in the plane of the deck, a support region which includes, in the plane of the deck, the region or regions, respectively, where one or more pillar-like structures extend from the deck.

22. The plastic infiltration unit according to any preceding claim, wherein the support structures in the proximal region have one of a circular, hexagonal and fluted cross-section and in the distal region have at least one of a circular, star shaped and fluted cross-section, respectively.

23. The plastic infiltration unit according to any preceding claim, wherein the support structures are conical.

24. The plastic infiltration unit according to any of claims 4 to 23, wherein the interaction structure is a foot portion of the pillar-like structure.

25. The plastic infiltration unit according to any of claims 21 to 24, wherein, in the interconnected condition, the foot portion of the plastic infiltration unit is disposed in the recess portion of the another identical plastic infiltration unit, in the support region.

26. The plastic infiltration unit according to any preceding claim, wherein the at least two support structures extend in a direction from the second surface which is perpendicular to plane in which the deck extends.

27. The plastic infiltration unit according to any preceding claim, wherein in the interconnected condition, the deck of the plastic infiltration unit and the another deck of the another identical plastic infiltration unit are aligned in the direction in which the support structures extend.

28. The plastic infiltration unit according to any of claims 4 to 27, wherein the interaction structure extends beyond the deck.

29. The plastic infiltration unit according to any of claims 4 to 28, wherein the interaction structure comprises a hollow containment structure which extends below the deck in the direction of the extension of the support structures, the hollow containment structure is arranged so that the foot portion of the another infiltration unit is received at a location away from the underside of the deck.

30. The plastic infiltration unit according to any of claims 4 to 29, wherein the interaction structure is arranged so that the location at which the foot portion of the another infiltration unit is received is arranged, so that the height of the plastic infiltration unit and the another identical plastic infiltration unit in the interconnected condition is variable.

31. A plurality of plastic infiltration units comprising a plastic infiltration unit according to any preceding claim and at least one another (second) plastic infiltration unit according to any preceding claim.

32. A system (an assembly) comprising at least two plastic infiltration units according to any preceding claim, the system including a first and a second plastic infiltration unit, wherein each plastic infiltration unit comprises:

a deck extending in a plane, the deck having a first and a second surface, wherein the first surface is arranged to face in a first direction and the second surface is arranged to face in a second direction, wherein the second direction is different, preferably, opposite to the first direction,

at least two support structures which are each connected to the deck at the second surface and extend from the second surface,

wherein each of the at least two support structures include a proximal portion located in a proximal zone with respect to the deck and a distal portion located in a distal zone with respect to the deck, and a reception location located in the proximal zone,

the first plastic infiltration and the second plastic infiltration unit can be placed in an interconnected condition, wherein, in the interconnected condition, the at least two support structures of the second plastic infiltration unit contact the at least two reception locations of the first plastic infiltration unit, so that a load exerted on the first plastic infiltration unit is transferred to the second plastic infiltration unit.

33. The system according to claim 32, wherein the first and the second plastic infiltration units are identical.

34. The plastic infiltration unit according to any preceding claim 3 to 33, wherein each of the at least two support structures define, in the plane of the deck, a support region which encloses, in the plane of the deck, the areas where the at least two pillar-like structures extend from the deck.

35. The plastic infiltration unit according to any claim 3 to 34, wherein at least one of the support structures, the pillar-like structures and legs have a draft angle, such that in the interconnected condition there is a gap between at least one of the support structures, the pillar-like structures and the legs of the plastic infiltration unit and the another identical plastic infiltration unit.

36. The plastic infiltration unit according to any claim 3 to 35, wherein at least one of the support structures, the pillar-like structures and legs have a draft angle, such that in the interconnected condition at least one of the support structures, the pillar-like structures and the legs of the plastic infiltration unit are in contact with at least one of the support structure, the pillar-like structures and the legs of the another identical plastic infiltration unit.