

A plastic infiltration unit

The present invention relates to a plastic infiltration unit, a system (an assembly) comprising at least two plastic infiltration units, a geotextile or geomembrane retention clip, a plastic side plate
5 for installation on a plastic infiltration unit, a middle plate for a plastic infiltration unit, a system (an assembly) comprising a middle plate and a first and second plastic infiltration unit.

Plastic infiltration units are known. Infiltration units (also known as attenuation units depending on the deployment conditions of the unit) are for the temporary storage of excess rainwater, enabling
10 controlled discharge. They are used for managing intense rainfall run-off and for reducing the risk of flooding. When the water stored in the unit is later discharged into a water impermeable system, such as a sewer, the unit may sometimes be referred to as an attenuation unit. When the stored water is later discharged into a water permeable system, such as the ground, the unit is generally referred to as infiltration units. Where reference is made in this text to an infiltration unit, it may
15 refer to a unit suitable for attenuation (attenuation unit) and/or infiltration (infiltration unit).

Plastic infiltration units may be stacked in a vertical array or arranged in a planar horizontal array or arranged in a 3 dimensional array. In use, the infiltration units are subject to different loads, for example, side loads and vertical loads depending on the particular arrangement of units. In
20 conventional infiltration units, it was found that portions of the structure, in particular, side walls, were flattened by the side load to which they were subjected to. Whilst this disadvantage may be addressed by increasing the wall thickness of the infiltration units, this results in an increase in the amount of material required, an increase in the weight of the unit, an increase in cost and manufacturing time.

25 In EP 1 932 975 A, an infiltration body is described. The infiltration body is in the form of a table having table legs. The legs are formed as grid structures.

A disadvantage of this infiltration body is that the grid structure requires a complex manufacturing
30 process and results in a structure which uses more material and which results in a unit having an increased weight and which requires a longer cooling time due to the increased material usage. Further, it has been found that the grid structure is not optimal for bearing compression loads, having a tendency to buckle under compression loads.

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.

5

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.

10

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:

15

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,

20

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.

25

30

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, 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.

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

According to a yet further aspect of the invention, there is provided a plastic infiltration unit comprising:

10 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
15 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.

20 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
25 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.

30 The present invention further relates to a geotextile or geomembrane retention clip.

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).

It is a further object of the present invention to provide a geotextile or geomembrane retention clip that will address at least one of the above-mentioned problems.

According to a yet further aspect of the invention, 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.

The present invention further relates to a plastic side plate for installation on a plastic infiltration unit.

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.

It is a further object of the present invention to provide a plastic side plate that will address at least one of the above-mentioned problems.

According to a yet further aspect of the invention, there is provided a plastic side plate for
5 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.

10

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.

15 It is a further object of the present invention to provide a further plastic side plate that will address at least one of the above-mentioned problems.

According to a yet further aspect of the invention, there is provided a plastic side plate for installation on a plastic infiltration unit, the plastic side plate comprising:

20 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.

25

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

The present invention further relates to a middle plate for a plastic infiltration unit.

30 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.

It is a further object of the present invention to address this problem.

The inventors of the present invention have identified that 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 than being directed towards the base wall of the other infiltration device.

According to a yet further aspect of the invention, 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.

According to a further aspect of the invention, 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;

Fig. 2 shows a front view of a plastic infiltration unit according to an embodiment of the invention;

Fig. 3 shows a side view of a plastic infiltration unit according to an embodiment of the invention;

- 5 Fig. 4 shows a plan (top) view (bird's eye view) of a plastic infiltration unit according to an embodiment of the invention;

Fig. 5 shows a plan view of an underside of the plastic infiltration unit, in particular, the deck, according to an embodiment of the invention;

10

Fig. 6 shows two plastic infiltration units according to an embodiment of the invention in an arrangement, in which a first plastic infiltration unit is stacked inside a second plastic infiltration unit, wherein the decks of the first and second plastic infiltration units face in the same direction;

- 15 Fig. 7 shows two plastic infiltration units according to an embodiment of the present invention in an arrangement, in which a first infiltration unit is stacked on (top of the deck) of a second plastic infiltration unit;

- 20 Fig. 8 shows two plastic infiltration units according to an embodiment of the invention in an arrangement, in which a first plastic infiltration unit and a second infiltration units are stacked inside one another, wherein the decks of the first and second infiltration units face in different directions;

- Fig. 9 shows two plastic infiltration units according to an embodiment of the invention: in particular Figs. 9a to 9d show how two plastic infiltration units according to an embodiment of the invention are manipulated so that they are moved from the arrangement shown in Fig. 6 to the arrangement shown in Fig. 7;
- 25

- Fig. 10 shows two plastic infiltration units according to an embodiment of the invention: in particular Figs. 10a to 10d show how two plastic infiltration units according to an embodiment of the invention are manipulated so that they are moved from the arrangement shown in Fig. 6 to the arrangement shown in Fig. 8;
- 30

Fig. 11 shows views of a portion of a support structure of a plastic infiltration unit according to an embodiment of the invention: in particular, Fig. 11a shows a portion of a support structure viewed

from an upper surface of the deck looking downward onto the support structure, and Fig. 11b shows the same portion of the support structure viewed from underneath the deck showing an underside of the support structure;

- 5 Fig. 12 shows a front view of a support structure according to an embodiment of the invention, wherein the support structure is shown in isolation;

Fig. 13 shows a support structure according to an embodiment of the invention in isolation;

- 10 Fig. 14. shows the underside of the support structure as shown in Fig. 13;

Fig. 15. shows a plan view of the underside of the support structure as shown in Figs. 13 and 14;

- Fig. 16 shows an alternative configuration for at least a portion of a support structure according to
15 an embodiment of the present invention;

Fig. 17 shows a further alternative configuration for at least a portion of a support structure according to an embodiment of the present invention;

- 20 Fig. 18 shows yet further alternative configurations for at least a portion of a support structure according to an embodiment of the present invention;

Fig. 19 shows a plan view of the underside of a deck to illustrate how clusters of support structures are configured: in particular Fig. 19. a to d shows various alternative configurations;

25

Fig. 20 shows an alternative arrangement to the arrangement shown in Fig.8 in which plastic infiltration units are stacked inside one another in an arrangement wherein the decks of the plastic infiltration units face in different directions, respectively: in particular, Fig. 20a shows a plan view of the underside of the plastic infiltration unit, Fig. 20b shows a first plastic infiltration unit and a
30 second infiltration unit in proximity to one another and Fig. 20c shows the first and second infiltration unit arranged inside one another;

Fig. 21 shows a plan (top) view (bird's eye view) of a plastic infiltration unit according to an embodiment of the invention (as shown in Fig. 4), in which the location in the plastic infiltration

unit of a geotextile or geomembrane retention clip according to an embodiment of the invention is shown;

Fig. 22 shows a geotextile or geomembrane retention clip according to an embodiment of the invention, in which the geotextile or geomembrane retention clip is integrated into a plastic infiltration unit;

Fig. 23 shows a plan view (bird's eye view) of a geotextile or geomembrane retention clip according to an embodiment of the invention, in which the geotextile or geomembrane retention clip is integrated into a plastic infiltration unit;

Fig. 24 shows a geotextile or geomembrane retention clip according to an embodiment of the invention, in which the direction of the introduction of the geotextile or geomembrane is indicated;

Figs. 25 and 26 show a geotextile or geomembrane retention clip according to an embodiment of the invention, in which the direction of the introduction of the geotextile or geomembrane is indicated;

Fig. 27 show further detail of a geotextile or geomembrane retention clip according to an embodiment of the invention;

Fig. 28 shows a geotextile or geomembrane retention clip according to an embodiment of the invention;

Fig. 29 shows a cross section in the Y-Z plane of the geotextile or geomembrane retention clip shown in Fig. 28;

Fig. 30 shows a front view of the geotextile or geomembrane retention clip shown in Figs. 28 and 29;

Fig. 31 shows the geotextile or geomembrane retention clip as shown in Figs. 28 to 30. in situ on a plastic infiltration unit;

Fig. 32 shows, in an unassembled arrangement, a plastic infiltration unit according to an embodiment of the present invention, a plastic side plate for installation on a plastic infiltration unit, a base plate on which a plastic infiltration unit may be installed, and a connector adapter which may be installed on the plastic side plate;

5

Fig. 33 shows, in an assembled arrangement, a plastic infiltration unit according to an embodiment of the present invention, a plastic side plate for installation on a plastic infiltration unit, a base plate on which the plastic infiltration unit is installed (in use), and a connector adapter installed on the plastic side plate (in use);

10

Fig. 34 shows a side view of the assembled arrangement of Fig. 33;

Fig. 35 shows a plastic side plate for installation on a plastic infiltration unit according to an embodiment of the invention;

15

Fig. 36 shows various views of the plastic side plate as shown in Fig. 35: in particular, Fig. 36a shows a side view of the plastic side plate as seen in the Y-Z plane, Fig. 36b shows a front view of the plastic side plate as seen in the X-Z plane, Fig. 36c shows a top view of the plastic side plate when viewed from above in the Y-Z plane, Fig. 36d shows an underneath view of the plastic side plate when viewed from below in the Y-Z plane;

20

Fig. 37a shows a detail of a plastic side plate according to an embodiment of the invention: in particular, Fig. 37 shows a plan view of a pipe stopper according to an embodiment of the invention; Fig. 37b shows the pipe stopper of Fig. 37b in isolation;

25

Fig. 38 shows a plastic side plate according to an embodiment of the invention and a pipe; in particular, Fig. 38a shows a plastic side plate according to an embodiment of the invention from a front side looking towards the side plate, Fig. 38b shows a plastic side plate according to an embodiment of the invention from a rear side view looking towards the rear side of the side plate;

30

Fig. 39 shows a connector adapter to be attached to a plastic side plate according to an embodiment of the invention;

Fig. 40 shows various views of the connection adapter as shown in Fig. 39: in particular, Fig. 40a shows a side view of the plastic side plate as seen in the Y-Z plane, Fig. 40b shows a front view of the plastic side plate as seen in the X-Z plane, Fig. 40c shows a top view of the plastic side plate when viewed from above in the Y-Z plane, Fig. 40d shows an underneath view of the plastic side plate when viewed from below in the Y-Z plane;

Fig. 41 shows details of the connection adapter as shown in Figs. 39 and 40; in particular, Fig. 41a shows a plan view of the connection adapter, in particular, detail from Fig. 40a, Fig. 41b depicts a perspective view of detail of the connection adapter shown in Fig. 40a and 41a, Fig. 41c shows a side view of detail of the connection adapter shown in Fig. 40d;

Fig. 42 shows, in an unassembled arrangement, a first plastic infiltration unit according to an embodiment of the present invention, a second plastic infiltration unit according to an embodiment of the present invention, in which the first and second plastic infiltration units are identical, and a middle plate according to an embodiment of the invention, on which the first and second plastic infiltration units may be installed;

Fig. 43 shows a side view in the Y-Z plane of the unassembled arrangement shown in Fig. 42;

Fig. 44, in an assembled arrangement, a first plastic infiltration unit according to an embodiment of the present invention, a second plastic infiltration unit according to an embodiment of the present invention, in which the first and second plastic infiltration units are identical, and a middle plate according to an embodiment of the invention, on which the first and second plastic infiltration units are installed (in use);

Fig. 45 shows a side view in the Y-Z plane of the assembled arrangement shown in Fig. 44;

Fig. 46 shows a front view in the X-Z plane of the assembled arrangement shown in Fig. 44;

Fig. 47 shows a middle plate for a plastic infiltration unit according to an embodiment of the invention;

Fig. 48 shows plan views of the middle plate as shown in Fig. 47: in particular, Fig. 48a top view of the middle plate when viewed from above in the Y-Z plane, Fig. 48b shows an underneath view of the middle plate when viewed from below in the Y-Z plane;

5

Fig. 49 shows front and side views of the middle plate as shown in Fig. 47: in particular, Fig. 49a shows a side view of the middle plate as seen in the Y-Z plane, Fig. 49b shows a front view of the plastic side plate as seen in the X-Z plane;

10 Fig. 50 shows detail of the plan views shown in Fig. 48: in particular, Fig. 50a shows detail of the top view of the middle plate and Fig. 50b shows detail of the underside of the middle plate;

In the drawings and in the detailed description hereinbelow, like reference signs denote like features. The invention is exemplified in the embodiments described below. The invention is not

15 limited to these embodiments.

Double strength embodiment

Fig. 1 shows a plastic infiltration unit according to an embodiment of the invention. The plastic
20 infiltration of the present invention may be arranged with one or more other plastic infiltration units to form an assembly. For example, as shown in Figs. 6 to 10 and Figs. 42 to 46. Fig. 2 shows a front view of a plastic infiltration unit according to an embodiment of the invention. Fig. 3 shows a side view of a plastic infiltration unit according to an embodiment of the invention. Fig. 4 shows a plan (top) view (bird's eye view) of a plastic infiltration unit according to an embodiment of the
25 invention. Fig. 5 shows a plan view of an underside of the plastic infiltration unit, in particular, the deck 4, according to an embodiment of the invention.

In the embodiments shown, the deck 4 extends in a plane, for example, the xy plane shown in Fig. 1. The longitudinal direction (or z direction) in which the support structure extends, is substantially
30 perpendicular to the plane of the deck (the xy plane shown in Fig. 1).

According to an embodiment of the invention, the plastic infiltration unit 2 comprises a deck 4 extending in a plane (xy). The deck 4 has a first surface 6 and a second surface 8. The first surface 6 is arranged to face in a first direction 10 (z) and the second surface 8 is arranged to face in a second

direction 20 (-z). The second direction 20 (-z) is different to the first direction 10 (z). In the embodiments, when the plastic infiltration unit is disposed with the support structures facing downward in the direction of gravity, the first surface is the upper surface of the deck and the second surface is the underside surface of the deck.

5

The plastic infiltration unit 2 further comprises at least two support structures 12 which are each connected to the deck 4 at the second surface 8 and extend from the second surface 8. Each of the at least two support structures 12 include a proximal portion 14 located in a proximal zone with respect to the deck 4 and a distal portion 16 located in a distal zone with respect to the deck, and a reception location 18 located in the proximal zone.

10

The proximal and distal zones 14, 16 of the support structure 12 define zones of the support structure 12 in terms of their relative location with respect to the deck 4 of the plastic infiltration unit 2. The proximal zone is defined as being a zone of the support structure located in the vicinity of the deck 4. The distal zone is defined as being a zone away (remote) from the deck 4.

15

Another identical plastic infiltration unit 2' comprising thus at least two another identical support structures 12' and the plastic infiltration unit 2 can be placed in an interconnected condition (refer, for example, to Fig. 8).

20

In the embodiments of the present invention, reference is made to a plastic infiltration unit comprising for example, a deck and support structures. Reference is also made to another identical plastic infiltration unit. The another plastic infiltration unit is identical to the plastic infiltration unit in as far as the components of the plastic infiltration unit are defined. For example, where reference is made to a plastic infiltration unit comprising a deck and support structures, the another identical plastic infiltration unit is identical in as far as the deck and support structures are concerned. The another plastic infiltration unit may differ in other respects, for example, with respect to markings or other functional components, such as handles, connectors, etc are concerned. In other words, the another (second) plastic infiltration unit is identical only with regard to the features that are defined for the (first) plastic infiltration unit.

25

30

In the interconnected condition, the at least two another support identical structures 12' contact the at least two reception locations 18 on the underside (second surface) 8, so that a load exerted on the plastic infiltration unit 2 is transferred to the identical plastic infiltration unit 2'.

According to this embodiment in the interconnected condition, the support structures 12' of the identical (second) plastic infiltration unit 2' are disposed so that they contact the underside of the deck 4 of the plastic infiltration unit 2, as shown in Fig. 8.

5

The plastic infiltration unit of the present invention is particularly versatile. As described above, a first plastic infiltration unit is disposable with a second plastic infiltration unit so that almost double strength is achieved, when the support structures of the second plastic infiltration unit are arranged to come into contact with the underside of the deck of the first plastic infiltration unit, as shown in Fig. 8. In this arrangement, the underside surfaces 8 (second surfaces 8, 8') of the first and second plastic infiltration units 2, 2' face each other. This arrangement may be referred to as an underside surface facing arrangement.

Further, as shown in Fig. 6, the plastic infiltration unit 2 of the present invention can also be disposed in a nested condition with a second plastic infiltration unit 2'. In this "nested" arrangement, the support structures 12 of the first plastic infiltration unit 2 are disposed within the hollow leg portions of the support structures 12' of the second plastic infiltration unit 2'.

Yet further as shown in Fig. 7, the plastic infiltration unit 2 of the present invention can also be disposed in a stacked condition with a second plastic infiltration unit 2'. In this "stacked" arrangement, the support structures 12 of the first plastic infiltration unit 2 are disposed on the deck 4' of the second plastic infiltration unit.

Due to the particular arrangement of the support structure(s) 12 and the deck 4 of the plastic infiltration unit of the present invention, the plastic infiltration unit can be disposed in any of an underside surface facing arrangement, a nested arrangement or a stacked arrangement.

Herein, where reference is made to a first and a second plastic infiltration unit 2, 2', this is also to be understood to be a reference to a plastic infiltration unit 2 and another identical plastic infiltration unit 2'.

Preferably, in use, at least one of the first and second direction is parallel to the direction of gravity.

Fig. 8 shows two plastic infiltration units according to an embodiment of the invention in the arrangement described above, in which a first plastic infiltration unit 2 and a second plastic infiltration unit 2' are disposed in the underside surface facing arrangement, wherein the second surfaces 8, 8' of the decks 4, 4' (and indeed, the first surfaces 6, 6' of the decks 4, 4') of the first and second infiltration units 2, 2' face in different directions, respectively. For example, the deck 4 of the first plastic infiltration unit 2 faces in the direction 10 (z) and the deck 4' of the second plastic infiltration unit 2' faces in a second different direction 20 (-z). In one embodiment, the second direction 20 (-z) is opposite to the first direction 10 (z).

10 The support structures 12 may be pillar-like support structures. A pillar-like support structure 12 is a support structure. The pillar-like support structure 12 may comprise one or more elements. The elements may be, for example, one of a pillar, a leg portion 12a, 12b, 12c. The leg portions may be hollow leg portions 12a, 12b, 12c. In some embodiments, a plurality of hollow leg portions 12a, 12b, 12c are arranged in a cluster to form the pillar-like support structure 12. The element or elements
15 of the pillar-like support structure 12 and the pillar-like support structure itself, may have an overall longitudinal shape extending in a longitudinal direction.

For example, with reference to Fig. 1 and Figs. 11, 14 and 15 each of the at least two support structures 12 include an interaction structure 22 located in the distal zone 16.

20

In the interconnected condition, the interaction structures 22 of the plastic infiltration unit 2 are in contact with the reception location 18' in the proximal zone of the identical plastic infiltration unit 2' (and vice versa) (refer to Fig. 8).

25 In one embodiment, the interaction structure includes a foot portion 22 of the pillar-like support structure 12 and the reception location includes a recess 18, so that in the interconnected condition, the foot portion 22 of the plastic infiltration unit 2 is disposed in the recess 18' of the identical plastic infiltration unit 2'.

30 In one embodiment, the recess 18 is an opening in the deck. The opening 18 may extend at least partially through the deck 4. In the embodiments shown in the Figures it extends entirely through the deck 4. In the interconnected condition, the foot portion 22 of the plastic infiltration unit 2 is disposed in the opening 18' of the identical plastic infiltration unit 2'. Preferably, the dimensions of

the foot portion 22 of the plastic infiltration unit 2 match the dimensions of the reception location 18' (recess/opening) of the another identical plastic infiltration unit 2'.

Preferably, the foot portion 22 includes at least one edge portion 24 and the recess 18 includes at least one edge portion 26 (refer to Figs. 11, 13 and 15), so that in the interconnected condition, the at least one edge 24 of the foot portion 22 of the plastic infiltration unit 2 is in contact with at least one edge of the recess of the identical plastic infiltration unit 2', so that force is transferred between the plastic infiltration unit 2 and the identical plastic infiltration unit 2' (and vice versa).

Fig. 6 shows two plastic infiltration units according to an embodiment of the invention in an arrangement, in which a first plastic infiltration unit 2 is nested inside a second plastic infiltration unit 2', wherein first surfaces 6, 6' the decks 4, 4' of the first and second plastic infiltration units 2, 2' face in the same direction. In this embodiment (as illustrated in Fig. 6), the at least two pillar-like support structures 12 comprise: a first pillar-like support structure 121 and a second pillar-like support structure 122 (refer to Fig. 1). The at least one of the first and second pillar-like support structures 12 includes a hollow leg portion 12a which is configured to fit inside at least one of the first and second pillar-like support structures 12' of the identical plastic infiltration unit 2' in the nested arrangement.

Fig. 7 shows two plastic infiltration units according to an embodiment of the present invention in an arrangement, in which a first infiltration unit is stacked on (top of the deck) of a second plastic infiltration unit. In this embodiment (as illustrated in Fig. 7), the first and second pillar-like support structures 12 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). For example, Fig. 9 shows two plastic infiltration units according to an embodiment of the invention: in particular Figs. 9a to 9d show how two plastic infiltration units 2, 2' according to this embodiment of the invention are manipulated so that they are moved from the arrangement shown in Fig. 6 to the arrangement shown in Fig. 7. Fig. 9a shows two plastic infiltration units in a nested arrangement. This arrangement is compact and is for example, typically used to transport the plastic infiltration units. Although, Fig. 9 shows only two plastic infiltration units, this is for illustration purposes only. Typically, for transportation several plastic infiltration units are stacked inside one another. Once the plastic infiltration units are to be deployed, they are taken out of the nested arrangement by lifting the uppermost infiltration unit or removing the lowermost infiltration

unit. This is shown in Fig. 9b, where the upper most plastic infiltration unit is lifted off the second plastic infiltration unit 2' in the direction 28 shown by the arrow. As depicted in Fig. 9c, one of the plastic infiltration units (in Fig. 9c, the upper plastic infiltration unit) is rotated 180 degrees about a central axis 30 extending through the deck of the plastic infiltration unit in a direction Z. Once rotated, as depicted in Fig. 9d, the first plastic infiltration unit 2 is placed on the deck 4' of the second plastic infiltration unit 2' by lowering the first plastic infiltration unit 2 in the direction 32 shown by the arrow. The arrangement of, in particular, first and second pillar-like support structures is versatile.

Fig. 10 shows two plastic infiltration units according to an embodiment of the invention: in particular Figs. 10a to 10d show how two plastic infiltration units according to an embodiment of the invention are manipulated so that they are moved from the arrangement shown in Fig. 6 to the arrangement shown in Fig. 8. As in Fig. 9b, in Fig. 10a the first plastic infiltration unit 2 is lifted off the second plastic infiltration unit 2' in the direction 28 shown by the arrow. In Fig. 10b, one of the plastic infiltration units 2' (in Fig. 10b, the lower (second) unit 2') is inverted so that the pillar-like support structures of the plastic infiltration units 2, 2' face towards each other. As shown in Fig. 10b, the second unit 2' is also rotated by 180 degrees around its central axis 34 as shown by arrow 36. In Fig. 10c, the two infiltration units 2, 2' are brought towards each other in the direction shown by the arrow 38, so that the pillar-like support structures are received at the reception locations 18 in the proximal zone of the respective other infiltration unit. Fig. 10d, shows the arrangement for deployment.

Fig. 20 shows an alternative embodiment to the arrangement shown in Figs. 8 and 10, in which plastic infiltration units are stacked inside one another in an arrangement wherein the second surfaces 8, 8' (and also the first surfaces 6, 6') of the decks 4, 4' of the plastic infiltration units 2, 2' face in different directions, respectively: in particular, Fig. 20a shows a plan view of the underside of the plastic infiltration unit, Fig. 20b shows a first plastic infiltration unit and a second infiltration unit in proximity to one another and Fig. 20c shows the first and second infiltration unit arranged inside one another. In this embodiment, the first pillar-like support structure 12 comprises a tapered, hollow leg portion 40 and the second pillar-like support structure 12 comprises a ring shaped leg portion 42. In this embodiment, the ring shaped leg portion 42 has a receiving recess extending along the direction of the leg portion, so that in the interconnected condition, the tapered, hollow leg portion 40 of the identical plastic infiltration unit 2' is received by the recess of the identical plastic infiltration unit 2.

Fig. 11 shows views of a portion of a support structure of a plastic infiltration unit according to an embodiment of the invention: in particular, Fig. 11a shows a portion of a support structure viewed from an upper surface of the deck looking downward onto the support structure, and Fig. 11b shows the same portion of the support structure viewed from underneath the deck showing an underside of the support structure. Fig. 12 shows a front view of a support structure according to an embodiment of the invention, wherein the support structure is shown in isolation, and wherein the orientation of the support structure is the same as that shown in Fig. 2. Fig. 13 shows a support structure according to an embodiment of the invention in isolation. Fig. 14. shows the underside of the support structure as shown in Fig. 13. Fig. 15. shows a plan view of the underside of the support structure as shown in Figs. 13 and 14. With regard to the embodiments shown in Figs. 12 to 15, the pillar-like support structures are shown in isolation. In practice, the pillar-like support structures are integrated into the plastic infiltration unit. For example, they may be integrally formed. By integrated, it is meant, for example, that the pillar-like support structures 12 are formed together with the deck 4 to form a plastic infiltration unit. The plastic infiltration unit may be manufactured as one piece. Alternatively, it may be manufactured as separate components and assembled together.

Reference is made herein to a system comprising at least two plastic infiltration units. However, the present invention is not limited in this respect. A system may comprise only one plastic infiltration unit in combination with other components, for example, but not limited to a system comprising a plastic infiltration unit, a base plate, a middle plate and/or a side plate, or any combination thereof.

In embodiments (with reference to Figs. 11 to 15) at least one of the first and second pillar-like support structure 12 comprises a plurality of leg portions 12a, 12b 12c arranged in a cluster around a (imaginary) central longitudinal axis 44 extending in a direction in which the at least two support structures 12 extend.

The axis may also be referred to as a geometric longitudinal axis. For example, a cluster or a leg portion may have symmetry around the longitudinal axis. For example, a leg portion may have a circular cross section but is not limited in this respect. Alternative cross-sections are shown and described with reference to Fig. 18.

For example, each of the plurality of leg portions 12a to 12c has a (imaginary) central longitudinal axis in the direction in which the at least two support structures 12 extend. Further, each cluster 12a, 12b, 12c has its own (imaginary) central axis 44, respectively. Each cluster comprises 2 or more leg portions. In the embodiments shown in Fig. 1 and Figs. 11 to 15, for example, each cluster
5 comprises 3 leg portions. However, the invention is limited in this respect. Further examples are given hereinbelow.

Preferable, the leg portions 12a, 12b, 12c are arranged equally spaced around the (imaginary) central longitudinal axis 44. In an alternative embodiment, they may be unequally spaced around
10 the (imaginary) central longitudinal axis. In one embodiment, at least one of the first and second pillar-like support structures 12 comprises a plurality of leg portions 12a, 12b, 12c arranged in a cluster around the (imaginary) central longitudinal axis 44 extending in the direction (Z) in which the at least two pillar-like support structures 12 extend.

15 According to an embodiment, the plastic infiltration unit 2 is configured so that it can be put in a nested condition with in an identical plastic infiltration unit 2', 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 (refer to Figs. 6, 9a and 10a).

20

As described above, in a further embodiment, each of the at least two support structures comprises a plurality of pillars 12 (also referred herein as a plurality of leg portions), so that in the interconnected condition a grouped set of pillars has double the number of pillars between two decks than for either the plastic infiltration unit or the identical plastic infiltration unit (refer to Figs.
25 8, 10d and 20).

In one embodiment, the plurality of leg portions 12a, 12b, 12c is equal to two or more leg portions. In the embodiment shown in, for example, Fig. 1, the plurality of leg portions is equal to 3.

30 As described above, with reference to Figs. 1 to 11, each of the at least two support structures 12 define, in the plane of the deck 4, a support region 14 (for example, also referred to as a proximal zone 14) includes, in the plane of the deck 4, the region or regions, respectively, where one or more pillar-like structures 12 extend from the deck 4.

The support structures 12 and leg portions 12a, 12b, 12c, may have different configurations. Fig. 16 shows an alternative configuration for at least a portion of a support structure according to an embodiment of the present invention. Fig. 17 shows a further alternative configuration for at least a portion of a support structure according to an embodiment of the present invention. Fig. 18 shows yet further alternative configurations for at least a portion of a support structure according to an embodiment of the present invention. For example, the support structures 12 in the proximal region 14 have one of a circular, hexagonal and fluted cross-section (refer to Figs. 18(a)i, (b)i, (c)i, (d)i, (e)i), and in the distal region have at least one of a circular, star shaped and fluted cross-section (refer to Figs. 18(a)j, (b)j, (c)j, (d)j, (e)j), respectively.

10 In Figs. 16 and 17, Figs. 16a and 17a depict an isolated leg portion 12a. In particular, these figures show the shape of the opening of the hollow leg portion 12a. Figs. 16b and 17b, show a view of the leg portion 12a along the z direction from underneath the leg portion 12a. Figs. 16c and 17c show, in particular, the shape of the distal portion 14 of the leg portion 12a. Figs. 18(a)(i) to (e)(i) show a view of the leg portion 12a and also show a view of the leg portion 12a along the z direction from underneath the leg portion 12a. Figs. 18(a)ii to (e)ii show the same leg portions 12a as Figs. 18(a)i to (e)i, respectively, but are presented so that the shape of the opening of the hollow leg portion 12a is seen.

In one embodiment, the support structures 12 are conical. Preferably, the interaction structure is a foot portion of the pillar-like structure 12. Further, in the interconnected condition, the foot portion 14 of the plastic infiltration unit 2 is disposed in the recess portion 18' of the another identical plastic infiltration unit 2', in the support region 14. Further, the at least two support structures 12 extend in a direction from the second surface 8 which is perpendicular to plane in which the deck 4 extends. As described in the interconnected condition, the deck 4 of the plastic infiltration unit 2 and the another deck 4' of the another identical plastic infiltration unit 2' are aligned in the direction in which the support structures 12 extend.

In one embodiment, the interaction structure 22 extends beyond the deck 4. Further, the interaction structure 22 may comprise a hollow containment structure which extends below the deck in the direction of the extension of the support structures 12. The hollow containment structure is arranged so that the foot portion 16' of the another infiltration unit 2' is received at a location away from the underside of the deck 4. Further, the interaction structure 22 may be arranged so that the location at which the foot portion 16' of the another infiltration unit 2' is

received is arranged, so that the height of the plastic infiltration unit 2 and the another identical plastic infiltration unit 2' in the interconnected condition is variable.

In embodiments, there is provided a plurality of plastic infiltration units comprising a plastic infiltration unit 2 and at least one another (second) plastic infiltration unit 2'. There is further provided a system (an assembly) comprising at least two plastic infiltration units 2, 2'. The system includes a first and a second plastic infiltration unit 2, 2'. Each plastic infiltration unit 2, 2' comprises: a deck 4, 4' extending in a plane. The deck 4, 4' has a first and a second surface 6, 6', 8, 8'. The first surface 6, 6' is arranged to face in a first direction 10 (z) and the second surface 8, 8' is arranged to face in a second direction 20 (-z). The second direction 20 is different, preferably, opposite to the first direction 10. Each plastic infiltration unit 2, 2' further comprises at least two support structures 12, 12' which are each connected to the deck 4, 4' at the second surface 8, 8' and extend from the second surface 8, 8'. Each of the at least two support structures 12, 12' includes a proximal portion 14, 14' located in a proximal zone with respect to the deck 4, 4' and a distal portion 16, 16' located in a distal zone with respect to the deck 4, 4', and a reception location 18, 18' located in the proximal zone. The first plastic infiltration 2 and the second plastic infiltration unit 2' can be placed in an interconnected condition. In the interconnected condition, the at least two support structures 12' of the second plastic infiltration unit 2' contact the at least two reception locations 18 of the first plastic infiltration unit 2. In this way, a load exerted on the first plastic infiltration unit is transferred to the second plastic infiltration unit. In one embodiment, the first and the second plastic infiltration units 2, 2' are identical.

Further, each of the support structures may have a (imaginary) central longitudinal axis 44. The central longitudinal axis 44 may extend in a direction of extension of the support structures 12, 12'.

25

Cluster embodiment

According to a further embodiment of the invention and, as with the previous embodiment, with reference to Figs. 1 to 20, there is provided a plastic infiltration unit 2 and another identical plastic infiltration unit 2'. Both plastic infiltration units 2, 2' comprise a deck 4, 4' extending in a plane (xy). The deck 4, 4' has a first surface 6, 6' and a second surface 8, 8'. The first surface 6, 6' is arranged to face in a first direction 10 (z) and the second surface 8, 8' is arranged to face in a second direction 20 (-z). The second direction 8, 8' different to the first direction 6, 6'. The plastic infiltration unit 2, 2' further comprises at least two pillar-like support structures 12, 12'. In particular, to illustrate the at least two pillar-like support structures, reference is made to Fig. 1 in which a first pillar-like

30

support structure is identified with the reference numeral 121 and a second pillar-like structure is identified with the reference numeral 122. The at least first and second pillar-like structures 121 and 122 are each connected to the deck 4, 4' at the second surface 8, 8' and extend from the second surface 8, 8'. Each of the at least two pillar-like support structures 12, 12' (121, 122 explained above) has a (imaginary) central longitudinal axis 44 and includes at least two pillar-like supports 12a, 12b, 12c. The pillar-like supports 12a, 12b, 12c may be leg portions. Herein the leg portions may also be described as pillars. The pillar-like supports may be hollow. The plastic infiltration unit 2, 2' is configured so that the another identical plastic infiltration unit 2' comprising at least two another pillar-like support structures 121, 122 and the plastic infiltration unit can be placed in an interconnected condition. With reference to, for example, Figs. 6 to 8, 9d, 10d and 20, in the interconnected condition, the (imaginary) central longitudinal axes 44 of the at least two pillar-like support structures 12 (121, 122) and the at least two another pillar-like support structures 12' are aligned. In one embodiment, the second direction 20 is opposite to the first direction 10. Further, the at least two pillar-like support structures 12, 12' may comprise: a first pillar-like support structure 121 and a second pillar-like support structure 122. They may further comprise a third or more pillar-like support structure 12. Hereinbelow, in the embodiments where a first and a second pillar-like support structure 121 and 122 (see Fig. 1) are described, it is also envisaged that these embodiments may also include a several more, for example, in the embodiment shown in Figs. 1 to 10 and 19, there is provided eight pillar-like support structures. In the embodiment shown in Fig. 20, there is provided 24 pillar-like support structures. The present invention is, however, not limited to any of two to 24 pillar-like support structures. It is envisaged that the support structure may include further pillar-like support structures.

As described above, the central axis may be referred to as a geometric axis. For example, a leg portion or cluster may have symmetry around the central axis.

Preferably, in use, at least one of the first and second direction is parallel to the direction of gravity.

Preferably, at least one of the first and second pillar-like support structures 12 includes a hollow leg portion 12a which is configured to fit inside at least one of the first and second pillar-like support structures 12' of the identical plastic infiltration unit 2' in a nested arrangement.

As described above with reference to Figs. 6, 8 and 9, the first and second pillar-like support structures 12 are configured so that when one of the plastic infiltration unit 2 and the identical

plastic infiltration unit 2' is rotated by 90 degrees and/or 180 degrees with respect to the other around an axis 30 extending through a central region of the plastic infiltration unit 2 in a direction substantially parallel to the direction (-z) in which the first and second pillar-like support structures extend, the plastic infiltration unit 2 is stackable on the deck 4' of the identical plastic infiltration unit 2' (and vice versa).

Preferably, in use, the direction of the (imaginary) central longitudinal axis extends in the direction of gravity.

10 In one embodiment, the first pillar-like support structure 12 and the second pillar-like support structure have the same draft angle.

Alternatively, the first pillar-like support structure 12 and the second pillar-like support structure 12 have different draft angles, respectively. In this alternative embodiment, in a stacked position, 15 the first and second pillar-like support structures 12 of the another plastic infiltration unit 2' have the same draft angle as the first and second pillar-like structures 12 of the plastic infiltration unit 2, respectively.

For example, with reference to Figs. 11 and 16 to 18, the support structures 12 in the proximal 20 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. In one particular embodiment, as depicted in Figs. 1 to 15, the first pillar-like support structure 12 and the second pillar-like support structure 12 are conical.

25 In one embodiment, at least one of the first and second pillar-like support structure 12 comprises a plurality of leg portions 12a, 12b, 12c arranged in a cluster around the (imaginary) central longitudinal axis 44 extending in the direction (-z) in which the at least two pillar-like support structures 12 extend.

30 In one embodiment, each of the first and second pillar-like support structures 12 have a common longitudinal axis 44 around which the plurality of leg portions 12a, 12b, 12c are arranged in a cluster, the common axis 44 extending in the direction (-z) in which the at least two pillar-like support structures 12 extend. Yet further, each of the plurality of leg portions 12a, 12b, 12c may have a (imaginary) central longitudinal axis 46 (refer to Fig. 12) in a direction in which the at least

two support structures 12 extend. In the embodiments shown in the Figures, the central longitudinal axis 46 (refer to Fig. 12) of the leg portions 12a, 12b, 12c is substantially parallel to the common longitudinal axis 44 (refer to Fig. 12). However, the present invention is not limited in this respect. It is envisaged that the central axis of the leg portions 12a, 12b, 12c may be angled with respect to the common longitudinal axis 44 of the cluster. In this regard, reference is made to Fig. 12 and the angled centreline 48, which is shown for illustrative purposes. It is to be noted that the central longitudinal axis 4 of the leg portions 12a, 12b, 12c shown in Fig. 12 is parallel to the common longitudinal axis 44.

10 In one embodiment, the leg portions 12a, 12b, 12c, 12a', 12b', 12c' are arranged equally spaced around the (imaginary) central longitudinal axis 44.

In an alternative embodiment, the leg portions 12a, 12b, 12c, 12a', 12b', 12c' may be arranged non-equally spaced around the (imaginary central longitudinal axis (common axis) 44.

15

With reference to Figs. 6, 9a and 10a, in embodiments, the plastic infiltration unit 2 is configured so that it can be put in a nested condition with an identical plastic infiltration unit 2', when the orientation of both infiltration units 2, 2' is the same (equal). In this arrangement, each of the pillar-like support structures 12 of the infiltration unit 2 is aligned to fit inside the respective each pillar-like support structure 12' of the identical infiltration unit. In Figs. 6, 9a and 10a, the pillar-like support structures 12 of the plastic infiltration unit 2 are only partly visible, since they are inserted into the pillar-like support structures 12' of the another identical plastic infiltration unit 2'.

20

In embodiments of the invention, each of the at least two pillar-like support structures 12 comprises a plurality of leg portions 12a, 12b, 12c (also referred to herein as pillars or pillar-like supports 12a, 12b, 12c). In further embodiments, for example, as shown in Figs. 8 and 10, the plurality of leg portions 12a, 12b, 12c may be arranged so that in the interconnected condition (refer to Fig. 8 and 10d) a grouped set (cluster) of leg portions (pillars) has double the number of leg portions (pillars) between two decks 4, 4' compared with the number of leg portions (pillars) extending from the deck 4 of the plastic infiltration unit. In this way, an arrangement is achieved that has a double the strength of a single plastic infiltration unit. This makes the unit suitable in a wide field of applications, including for example, transport and infrastructure applications, such as roads.

30

In embodiments, the plurality of leg portions 12a, 12b, 12c is equal to two or more leg portions, preferably 2, 3 or 4. In the specific embodiments shown in Figs. 1 to 15, the pillar-like support structures 12 have 3 leg portions 12a, 12b, 12c. However, the invention is not limited in this respect.

- 5 With reference to Figs. 1 to 15, and in particular, with reference to Figs. 11a and 11b, each of the at least two support structures 12 define, in the plane of the deck 4, a support region S which encloses, in the plane of the deck 4, the areas where the at least two pillar-like structures 12 extend from the deck 4. In Fig. 11b, the support region S extends around the outer circumference of the leg portions 12a, 12b, 12c where they extend from the underside surface 8 of the deck 4. The
10 support region S may further extend through the deck 4 to the upper surface as depicted in Fig. 11a.

- With reference, for example to Figs. 1 to 3 and 11, each of the pillar-like structures 12 may comprise an interaction structure 22. The interaction structure 22 is, for example, a foot portion 16 of the
15 pillar-like structure 12. In the interconnected condition, the foot portion 16 of the plastic infiltration unit 2 is disposed in the recess portion 18' of the another identical plastic infiltration unit 2', in the support region S.

- In one embodiment, the recess 18 is an opening in the deck. The opening 18 may extend at least
20 partially through the deck 4. In the embodiments shown in the Figures it extends entirely through the deck 4. In the interconnected condition, the foot portion 22 of the plastic infiltration unit 2 is disposed in the opening 18' of the identical plastic infiltration unit 2'. Preferably, the dimensions of the foot portion 22 of the plastic infiltration unit 2 match the dimensions of the reception location 18' (recess/opening) of the another identical plastic infiltration unit 2'.
- 25 Further, in the interconnected condition, the foot portions 16' of the another identical plastic infiltration unit 2' are disposed between the leg portions 12a, 12b, 12c of the plastic infiltration unit.

- As mentioned, the plastic infiltration unit 2 is configured to be nested within the another identical plastic infiltration unit 2'. It may be further configured (refer to Fig. 7 and 9) so that when one of
30 either the plastic infiltration unit 2 or the another identical plastic infiltration unit 2' is rotated by 180 degrees, the plastic infiltration unit 2 can be stacked on the another deck 4' of the another identical plastic infiltration unit 2'. Further (refer to Figs. 8 and 10), when one of either the plastic infiltration unit 2 or the another identical plastic infiltration unit 2' is rotated by 180 degrees and is

inverted, the plastic infiltration unit 2 and the another identical plastic infiltration unit 2' are disposed in the interconnected condition.

Reference is made to Fig. 19, which shows a plan view of the underside 8 of a deck 4 to illustrate how clusters of support structures 12 are configured. In particular, Fig. 19. a to d shows various alternative configurations.

In the embodiments shown in Figs. 19a to c, in the plane of the deck 4, the plastic infiltration unit includes a first sector (half) 50 (shown above the dotted lines in Fig. 19) in which a first set of clusters 121, 122, 123, 124 are disposed and a second sector (half) 52 (shown below the dotted lines in Fig. 19) adjacent to the first sector (half) 50 in the plane of the deck in which a second set of clusters 125, 126, 127, 128 are disposed.

In the embodiments shown in Fig. 19a and 19b, the first and second sets of clusters 121-128 include 4 clusters. However, the invention is not limited in this respect. The first set of clusters 121, 122, 123, 124 may include 2, 4, 6 or 8 clusters. The second set of clusters 125, 126, 127, 128 may include 2, 4, 6 or 8 clusters.

In the embodiments shown in Figs. 19a and 19b, the first set of clusters 121, 122, 123, 124 may be arranged in a similar (same) manner as the second set of clusters 125, 126, 127, 128.

In the embodiments shown in Fig. 19c, in the plane of the deck 4, the first four clusters 121, 122, 123, 124 are rotated by 45 degrees with respect to the second four clusters 125, 126, 127, 128.

In the embodiment shown in Fig. 19d, in the plane of the deck 4, the plastic infiltration unit 2 includes a first sector 501 in which a first set of clusters 121, 122 are disposed, a second sector 502 adjacent to the first sector 501 in the plane of the deck 4 in which a second set of clusters 123, 124 are disposed, a third sector 521 adjacent to the second sector 502 in the plane of the deck 4 in which a third set of clusters 125, 126 are disposed and a fourth sector 522 adjacent to the third sector 521 in the plane of the deck 4 in which a fourth set of clusters 127, 128 are disposed. In Fig. 19d, the dotted lines are shown to indicate the first, second, third and fourth sectors 501, 502, 521, 522, respectively.

In Fig. 19d, the first set of clusters 121, 122 and the third set of clusters 125 and 126 are arranged in a similar manner and the second set of clusters 123, 124 and the fourth set of clusters 127, 128 are arranged in a similar manner.

- 5 In Fig. 19, in Figs. 19a and 19b, each set of clusters comprises 3 leg portions. In Figs. 19c and 19d, each set of cluster comprises 4 leg portions. The sets of clusters are not limited in this respect. In embodiments, the first and third set of clusters 121, 122, 125, 126 are rotated with respect to the second and fourth set of clusters 123, 124, 127, 128 by for example, 90 degrees when each set of clusters comprises 2 pillar-like support structures (leg portions), 30 degrees when each set of clusters comprises 3 pillar-like support structure (leg portions) and 45 degrees when each set of clusters comprises 4 pillar-like support structures (leg portions).
- 10

- In embodiments, each set of clusters includes at least two pillar-like support structures, for example, two, three (refer to Figs. 19a and 19b), four (refer to Figs. 19c and 19d) or twelve (refer to Fig. 20).
- 15

In embodiments, each set of clusters includes the same number of pillar-like support structures.

- With the arrangement of clusters shown in Fig. 19, the plastic infiltration unit can be arranged, for example, in the configurations shown in Figs. 6 to 8.
- 20

In alternative embodiments, each set of clusters includes a non-equal number of pillar-like support structures.

- 25 Further, at least one of the support structures 12, the pillar-like structures 12 and legs 12a, 12b, 12c have a draft angle, such that in the interconnected condition there is a gap between at least one of the support structures 12, the pillar-like structures 12 and the legs 12a, 12b, 12c of the plastic infiltration unit 2 and the another identical plastic infiltration unit 2'.

- 30 In an alternative embodiment, at least one of the support structures 12, the pillar-like structures 12 and legs 12a, 12b, 12c have a draft angle, such that in the interconnected condition at least one of the support structures 12, the pillar-like structures 12 and the legs 12a, 12b, 12c of the plastic infiltration unit 2 are in contact with at least one of the support structure 12', the pillar-like structures 12' and the legs 12a', 12b', 12c' of the another identical plastic infiltration unit 2'.

The plastic infiltration unit may be made by injection molding from thermoplastic material.

5 The support structure 12 extends from the deck 4. The support structure 12 may be arranged away from the edge of the underside 8 of the deck 4 so as to allow one or more side panels to be attached to the outer side or sides of the plastic infiltration unit. In the case where a plurality of support structures 12 are provided, the support structures 12 are disposed with respect to one another so that access to the inside of the plastic infiltration unit is provided, for example, by an inspection apparatus. A function of the support structure is to transfer load. A further function of the support structure with regard to their position on the underside 8 of the deck 4 is to transfer load whilst providing access to, for example, inspection apparatus.

15 In the embodiments described herein and shown in the figures, the deck 4 extends in a plane, for example, the xy plane shown in Fig. 1. The longitudinal directions 10, 20 (or z and -z directions) is substantially perpendicular to the plane of the deck (the xy plane shown in Fig. 1). Further, the support structures extend in the z (-z) direction. The invention is not limited in this respect, however. In particular, it is envisaged that the plane in which the deck extends is not flat. For example, it may be tilted or curved.

20 The deck of a (first) infiltration unit provides a structure into which support structures of the (first) plastic infiltration unit extend from and into which support structures of another (second) plastic infiltration unit are insertable into. The support structures 12 are provided to support a load. The load includes a load from surrounding plastic infiltration units and the load of any water. The load may also include further additional external loads, such as vehicles, machinery and the like. The load is transferred via the support structure 12 also through the deck 4. As described above, the embodiments shown in Figs. 8, 10d and 20 are particularly suited to supporting loads.

30 The deck of a plastic infiltration unit may also be referred to as a "top" deck. It may be referred to as a top deck since the pillars of the same plastic infiltration unit extend from an underside of the deck. Therefore, when the plastic infiltration unit is deployed the deck is on the top of the support structure. The "top" deck of a first plastic infiltration unit, when deployed, however, may form the base for a second plastic infiltration unit disposed on top of (stacked on) the first plastic infiltration unit, as depicted in Figs. 7 and 9d).

In this disclosure reference is made to a plastic infiltration unit 2, also referred to as a (first) plastic infiltration unit 2. Reference is also made to another plastic infiltration unit 2', also referred to as a (second) plastic infiltration unit 2'. Yet further plastic infiltration units, for example, third to nth plastic infiltration units may also be referred to. According to embodiments of the invention, these plastic infiltration units (first to nth) may be connected and arranged in various ways, for example, in layers and/or stacked or temporarily stacked for storage and/or transportational reasons. In embodiments, the plastic infiltration units are constructed in the same way, so that, the first to nth plastic infiltration units 2 are the same, that is identical.

10 In this disclosure, reference is further made to upper and lower surfaces, and undersides etc. of a plastic infiltration unit. As mentioned above, reference is may also be made to a top deck. In this connection, this terminology refers to the general, relative orientation of the various features of the plastic infiltration unit when deployed.

15 In one embodiment, the support structure 12 is integratably formed in the deck 4 so that an upper end 14 (also referred herein as the proximal end) of the support structure 12 forms a part of the deck 4 into which an interaction structure 22 (also referred herein as the distal end) of a second support structure 12 is insertable.

20 Geotextile or geomembrane retention clip embodiment

According to a further aspect of the present invention, there is provided a geotextile or geomembrane retention clip. The retention clip is for retaining a geotextile or geomembrane on a plastic infiltration unit. The clip may be integrated into the plastic infiltration unit or may form a separate, discrete part, that is attached or connected to the plastic infiltration unit in use.

Fig. 21 shows a plan (top) view (bird's eye view) of a plastic infiltration unit according to an embodiment of the invention (as shown in Fig. 4), in which the location in the plastic infiltration unit of a geotextile or geomembrane retention clip 60 according to an embodiment of the invention is shown. Fig. 22 shows a geotextile or geomembrane retention clip according to an embodiment of the invention, in which the geotextile or geomembrane retention clip is integrated into a plastic infiltration unit. Fig. 23 shows a plan view (bird's eye view) of a geotextile or geomembrane retention clip according to an embodiment of the invention, in which the geotextile or geomembrane retention clip is integrated into a plastic infiltration unit. Fig. 24 shows a geotextile

or geomembrane retention clip according to an embodiment of the invention, in which the direction of the introduction of the geotextile or geomembrane is indicated. Figs. 25 and 26 show a geotextile or geomembrane retention clip according to an embodiment of the invention, in which the direction of the introduction of the geotextile or geomembrane is indicated. Fig. 27 show
5 further detail of a geotextile or geomembrane retention clip according to an embodiment of the invention.

In the embodiments shown in Figs. 1, 4 and 21 to 27, the clip is integrated into the deck 4 of a plastic infiltration unit 2.

10

According to an embodiment, a geotextile or geomembrane retention clip 60 is provided. The clip 60 is for retaining a geotextile or a geomembrane on a plastic infiltration unit 2. The retention clip 60 comprises a deformable retaining hook 62 which is deformable to allow the geotextile or geomembrane to be inserted under the deformable hook 62. The geotextile or geomembrane
15 retention clip 60 is elastically deformable. In Figs. 24, 25 and 26, the direction of the insertion of the geotextile or geomembrane is indicated by arrow 64. The clip is arranged to retain the geotextile or geomembrane once it has been inserted.

The clip 60 further comprises a deformable portion 66. In particular, the deformable retaining hook 62 comprises at least one tooth portion 62, preferably two or three teeth portions which extend from the deformable portion 66.
20

With reference to Figs. 26 and 27, the clip 60 may further comprise a support portion 68 arranged to support a geotextile or geomembrane when it is inserted into the retention clip 60. In one embodiment, the support 68 extends from the deformable portion 66 and defines a support region in which the geotextile or geomembrane is supported. Preferably, the hook 60 is configured so that it extends into the support region. Further, the deformable portion 66, the hook 62 and the support portion 68 are arranged such that when a geotextile or geomembrane is inserted into the clip 60, the clip 60 deforms to allow the geotextile or geomembrane to be inserted and then exerts a force
25 30 on the geotextile or geomembrane located between the hook 62 and the support portion 68, to retain the geotextile or geomembrane in position on the support portion 68.

In one embodiment, the hook 62 comprises at least two teeth portions 62 which are arranged so that one is positioned on either side of the support portion 68.

Further, the retaining hook 62 may be angled with respect to a direction of insertion 64 of the geotextile or geomembrane so that when the geotextile or geomembrane is inserted in the direction of insertion 64 into the clip 60, the deformable portion 66 deforms to open the clip 60 to
5 allow the geotextile or geomembrane to be inserted into the clip 60 and does not open when a force is applied in a direction 70 substantially opposite to the insertion direction (refer to Figs. 25 and 26).

Further, the retaining hook 62 may have a negative angle to retain the geotextile in the clip 60 once
10 it has been inserted.

Yet in a yet further embodiment (not shown in the figures), in the case where the hook comprises two teeth portions 62, one tooth portion is arranged to extend from the at least one deformable portion 66 on either sides of the deformable portion 66 or in the case where the hook 60 comprises
15 two deformable portions, one tooth portion is arranged to extend from each of the two deformable portions.

In particular, the geotextile or geomembrane retention clip 60 is configured so that a reaction force is downward.
20

Figs 28 to 31 depict retention clips that are not formed integrally in the plastic infiltration unit. Fig. 28 shows a geotextile or geomembrane retention clip according to an embodiment of the invention. Fig. 29 shows a cross section in the Y-Z plane of the geotextile or geomembrane retention clip shown in Fig. 28. Fig. 30 shows a front view of the geotextile or geomembrane retention clip shown
25 in Figs. 28 and 29. Fig. 31 shows the geotextile or geomembrane retention clip as shown in Figs. 28 to 30. in situ on a plastic infiltration unit.

In the embodiments shown in, for example, Figs. 28 to 31, the geotextile or geomembrane retention clip is a sheet metal clip. In the embodiments shown in Figs. 21 to 27, the retention clip is an
30 injection moulded clip. The injection moulded clip may be injection moulded integrally with the plastic infiltration unit. Alternatively, as with the sheet metal clips of Figs. 28 to 31, it may be formed as a separate part. For example, the geotextile or geomembrane retention clip may be a single component.

According to one embodiment, there is provided a plastic infiltration unit comprising a first surface 6 on which a geotextile is to be disposed, and a geotextile or geomembrane retention clip 60 for retaining the geotextile on the surface 6. As already described, the geotextile retention clip may be integrally formed in the plastic infiltration device.

5

In this embodiment, the plastic infiltration unit may comprise a deck 4 extending in a plane xy. The deck may have a first surface 6 and a second surface 8. The first and second surfaces 6, 8 oppose one another. The geotextile is to be disposed on the first surface 6. In one embodiment, the geotextile retention clip 60 is integrally formed in the first surface. In particular, an upper surface 72 (refer to Fig. 26) of the geotextile retention clip 60 is flush with the first surface 6.

10

Fig. 28 shows an embodiment, where the clip 60 is sheet metal. Holes 74 are provided in order to attach the clip to the infiltration device, by means such as screws or the like.

Fig. 31 shows an arrangement, whereby the clip 60 of Figs. 28 to 30 is installable on a plastic infiltration unit 2. In the embodiment shown, the clip 60 is disposed on the first surface 6 of the infiltration unit at the same location as integrally formed clips are disposed. In any case, it is not necessary to provide both an integrated clip and a separate clip.

20 Side plate with pipe stopper embodiment

According to a further aspect of the present invention, there is provided a plastic side plate with a pipe stopper. The plastic side plate 80 may be injection moulded, rotomoulded, extruded or blowmoulded.

25

Fig. 32 shows, in an unassembled arrangement, a plastic infiltration unit 2 according to an embodiment of the present invention. The plastic infiltration unit shown in Figs. 32 to 50 is the same as that described and shown with reference to Figs. 1 to 15, and is not repeated hereinbelow.

Fig. 32 further depicts a plastic side plate 80 for installation on a plastic infiltration unit 2, a base plate 90 on which a plastic infiltration unit 2 may be installed, and a connector adapter 110 which may be installed on the plastic side plate 80.

30

Fig. 33 shows, in an assembled state the arrangement depicted in Fig. 32. In particular, the plastic infiltration unit 2, the plastic side plate 80 for installation on a plastic infiltration unit, the base plate 90 on which the plastic infiltration unit is installed, and a connector adapter 110 installed on the plastic side plate. Fig. 34 shows a side view of the assembled arrangement of Fig. 33. Fig. 35 shows a plastic side plate 80 for installation on a plastic infiltration unit 2 according to an embodiment of the invention. Fig. 36 shows various views of the plastic side plate 80 as shown in Fig. 35. In particular, Fig. 36a shows a side view of the plastic side plate 80 as seen in the Y-Z plane, Fig. 36b shows a front view of the plastic side plate 80 as seen in the X-Z plane, Fig. 36c shows a top view of the plastic side plate 80 when viewed from above in the Y-Z plane, Fig. 36d shows an underneath view of the plastic side plate 80 when viewed from below in the Y-Z plane. Fig. 37a shows a plan view of a detail of a plastic side plate 80 according to an embodiment of the invention. In particular, Fig. 37a shows a pipe stopper 82 according to an embodiment of the invention. Fig. 37b shows the pipe stopper of Fig. 37a in isolation.

Fig. 38 shows a plastic side plate 80 according to an embodiment of the invention and a pipe 120. In particular, Fig. 38a shows a plastic side plate according to an embodiment of the invention from a front side looking towards the side plate, Fig. 38b shows a plastic side plate according to an embodiment of the invention from a rear side view looking towards the rear side of the side plate.

According to an aspect of the present invention, and with reference to Figs. 32 to 38, there is provided a plastic side plate 80 for installation on a plastic infiltration unit 2. The plastic side plate 80 comprising a main body 84 and an opening 86 for receiving a pipe 120. The plastic side plate 80 may include one or more openings 86. In the embodiments shown in Figs. 32 to 38, the plastic side plate has two openings 86. The plastic side plate 80 further comprises a pipe stopper 82 for limiting the extent to which the pipe 120 is insertable into the plastic infiltration unit 2. The pipe stopper 82 is integrally formed in the plastic side plate 80.

In one embodiment, with reference, in particular, to Figs. 32 and 37, the pipe stopper 82 is detachably connected to the main body 84 with at least one connecting branch 89. The at least one connecting branch 89 is configured to detach from the main body 84 when the pipe 120 is inserted into the opening 86, releasing the pipe stopper 82 from the main body 84 in the direction in which the pipe 120 is insertable.

In particular, the pipe stopper 82 is detachably connected at one or two detaching locations 801, 802 to allow the pipe stopper 82 to rotate with respect to the main body 84.

Preferably, the pipe stopper 82 comprises a film hinge 803 and a retention hook 804 (refer to Figs. 37a, b and 38). The retention hook 804 is arranged to pivot around the film hinge 803. In this way, when the pipe 120 is inserted into the opening 86 the retention hook 804 is arranged to retain the pipe 120.

5

In a further embodiment, pipe stopper 82 may comprise a guide portion 805 located between the film hinge 803 and the retention hook 804. The guide portion 805 is dimensioned to guide the pipe 120 towards the retention hook 804 as the pipe 120 is inserted into the opening 86. In this way, the pipe 120 can be smoothly inserted into the opening 86.

10

In particular, the pipe stopper 82 has a starting position, as shown in Figs. 32 to 37, and a stop position, as shown in Fig. 38. In the starting position, the pipe stopper 82 is aligned with the main body 84. In the stop position, the pipe stopper 82 is pivoted with respect to the main body 84. Further, when the pipe 120 is inserted into the opening 86 the retention hook 804 is arranged to pivot to reach the stop position.

15

Side plate with cut-out for connector adapter (bayonet) embodiment

According to a further aspect of the present invention, and with reference to Figs. 32 to 36 and Figs. 39 to 41, there is provided a plastic side plate including at least one cut-out for receiving at least one attachment part of a connection adapter 110 to be attached to the plastic side plate 80.

20

Fig. 39 shows a connector adapter 110 to be attached to a plastic side plate 80 according to an embodiment of the invention. Fig. 40 shows various views of the connection adapter 110 as shown in Fig. 39. In particular, Fig. 40a shows a side view of the plastic side plate 80 as seen in the Y-Z plane, Fig. 40b shows a front view of the plastic side plate 80 as seen in the X-Z plane, Fig. 40c shows a top view of the plastic side plate 80 when viewed from above in the Y-Z plane, Fig. 40d shows an underneath view of the plastic side plate 80 when viewed from below in the Y-Z plane. Fig. 41 shows details of the connection adapter as shown in Figs. 39 and 40. In particular, Fig. 41a shows a plan view of the connection adapter, in particular, detail from Fig. 40a. Fig. 41b depicts a perspective view of detail of the connection adapter shown in Fig. 40a and 41a and Fig. 41c shows a side view of detail of the connection adapter shown in Fig. 40d.

25

30

Further, according to this aspect of the present invention, there is provided a plastic side plate 80 for installation on a plastic infiltration unit 2. The plastic infiltration unit 2 may be a plastic infiltration unit described herein, but is not limited in this respect. The plastic side plate 80 comprises a main body 84. The main body 84 comprises an opening 86 and at least one cut-out 111
5 for receiving at least one attachment part 112 of a connection adapter 110 to be attached to the plastic side plate 80. The side plate 80 comprises a connector 83 for connecting the side plate to a plastic infiltration unit. The plastic side plate 80 further comprises at least one guide part 114 (refer to Figs. 32 and 36). In particular, the at least one cut-out 111 and the at least one guide part 114 are arranged in the vicinity of the opening 86 so that the connection adapter 110 is rotatably
10 attachable to the plastic side plate 80.

In one embodiment, the at least one cut-out 111 and the at least one guide part 114 are arranged so that when the attachment part 112 is introduced into the cut-out 111 and rotated with respect to the plastic side plate 80, the connection adapter 110 is received and guided to a position in which
15 the connection adapter 110 is attached to the plastic side plate (refer to Figs. 33 and 34).

According to a further aspect of the present invention, there is provided a connector adapter 110 for connection to a plastic side plate 80. For example, the plastic side plate as described with reference to Figs. 32 to 38). In one embodiment, the connection adapter 110 comprises an
20 attachment part 112 for attaching the connection adapter 110 to the plastic side plate 80. The attachment part 112 is arranged to be received at a cut-out 111 and guided to a stop position by a guiding part 114 when the connector adapter 110 is rotated with respect to the plastic side plate 80.

Preferably, the attachment part 112 comprises a groove 116 for receiving the guiding part 114
25 (refer to Fig. 41).

"Mirror stacking" embodiment

30 According to a further aspect of the present invention, and with reference to Figs. 42 to 50, there is provided a middle plate 150 for a plastic infiltration unit 2.

The plastic infiltration unit 2 (and the identical another plastic infiltration unit 2') correspond to the plastic infiltration units described hereinabove, and their description is omitted here.

Fig. 42 shows, in an unassembled arrangement, a first plastic infiltration unit 2 according to an embodiment of the present invention, a second plastic infiltration unit 2' according to an embodiment of the present invention, in which the first and second plastic infiltration units 2, 2' are identical. Fig. 42 further depicts a middle plate 150 according to an embodiment of the invention, on which the first and second plastic infiltration units 2, 2' may be installed. Fig. 43 shows a side view in the Y-Z plane of the unassembled arrangement shown in Fig. 42. Fig. 44, shows in an assembled arrangement, a first plastic infiltration unit 2 according to an embodiment of the present invention, a second plastic infiltration unit 2' according to an embodiment of the present invention, in which the first and second plastic infiltration units 2, 2' are identical, and a middle plate 150 according to an embodiment of the invention, on which the first and second plastic infiltration units 2, 2' are installed (in use). Fig. 45 shows a side view in the Y-Z plane of the assembled arrangement shown in Fig. 44. Fig. 46 shows a front view in the X-Z plane of the assembled arrangement shown in Fig. 44. Fig. 47 shows a middle plate 150 for a plastic infiltration unit 2 according to an embodiment of the invention. Fig. 48 shows plan views of the middle plate as shown in Fig. 47. In particular, Fig. 48a shows a top view of the middle plate 150 when viewed from above in the Y-Z plane, Fig. 48b shows an underneath view of the middle plate 150 when viewed from below in the Y-Z plane. Fig. 49 shows front and side views of the middle plate 150 as shown in Fig. 47. In particular, Fig. 49a shows a side view of the middle plate 150 as seen in the Y-Z plane, Fig. 49b shows a front view of the plastic side plate as seen in the X-Z plane. Fig. 50 shows detail of the plan views shown in Fig. 48. In particular, Fig. 50a shows detail of the top view of the middle plate 150 and Fig. 50b shows detail of the underside of the middle plate.

According to this aspect of the present invention, there is provided a middle plate 150 for a plastic infiltration unit 2. The middle plate 150 extends in a plane (xy). The middle plate 150 having a first surface 152 and a second surface 154. The first and second surfaces 152, 154 are different from one another. In particular, the first surface 152 comprises a plurality of first reception zones 156 and the second surface 154 comprises a plurality of second reception zones 158. The first reception zones 156 are configured to receive a first plurality of pillar-like support structures 12 having a central axis 44 of a first plastic infiltration unit 2 and the second reception zones 158 are configured to receive a second plurality of pillar-like support structures 12' having a central axis 44 of a second plastic infiltration unit 2'. The first and second reception zones 156, 158 are configured, so that the central axes 44 of the first and second plurality of pillar-like support structures 12, 12' are aligned.

In this way, a force exerted on the first plastic infiltration unit 2 is transferred the first plurality of pillar-like support structures 12 to the second plurality of pillar-like support structures 12'.

Each first reception zone 156 may be a recessed portion formed in the middle plate 150. Typically,
5 the first reception zones 156 are formed on the upper facing side (top side) of the middle plate. The recessed portion may have a flat portion 161 arranged to receive a first plurality of pillar-like support structures 12, for example, a first cluster (grouped set of pillar-like structures). The recessed portion may further comprise a wall structure 162 surrounding the flat portion. The flat portion may comprise a plurality sockets 164 arranged to receive a foot portion of one of the pillar-
10 like support structures. Preferably, the sockets 164 are formed in the flat portion. In this way, each pillar-like support structure 12 is received in a socket within the recessed portion.

The second reception zones 158 are configured to receive a second plurality of pillar-like support structures 12'. Typically, the second reception zones 156 forms the lower facing side (underside) of
15 the middle plate.

The second reception zones 158 comprise a plurality of sockets 168 and arranged so as to correspond to (align with) the sockets of the first reception zones 156. The plurality of sockets are arranged to receive a foot portion of one of the pillar-like support structures 12'. In one
20 embodiment, the sockets of the first reception zones 156 form a plurality of through hole sockets, respectively, with the sockets of the second reception zones 158, so as to form a plurality of single sockets extending through the middle plate 150. In other words, each socket 164 and each socket 168 together form a single socket.

25 In this case, the first plurality of pillar-like support structures are insertable into the plurality of single sockets (through hole sockets) extending through the middle plate from the top and the second plurality of pillar-like support structures are inserted to the same corresponding plurality of single sockets from below.

30 In this way, the first and second plurality of pillar-like support structures are perfectly aligned.

Further, in a region including the first reception zone 156 and the second reception zone 158, there may also be provided at least one orientation feature 166 which allows for only certain ones of the pillar-like support structures 12, 12' to be insertable into the middle plate 150. In this way,

installation is simplified, since only those infiltration units correctly orientated can be installed on the middle plate. This reduces the chances of installation errors. In particular, the at least one orientation feature may be disposed in at least one of the sockets.

5 In embodiments, support structures 12, 12', for example, including the plurality of pillar-like support structures 12, 12', may each comprise one or more orientation features which are arranged to interact with the orientation features of the middle plate or other features of the plastic infiltration unit. The one or more orientation feature of the support structures 12, 12', for examples, the plurality of pillar-like support structures 12, 12', may be comprised in the interaction structure
10 22.

In embodiments, orientation feature 166 has a click fixation function which allows the first and second pluralities of pillar-like support structures to click into position in the middle plate. In this way, the orientation feature 166, and in particular, the click fixation function, aids positioning.

15

In the embodiment shown in the Figures, the middle plate comprises eight first reception zones 158 and eight second reception zones 148. In the embodiments shown in the Figures, each reception zone comprises three sockets. The present invention is not limited in this respect, however. The middle plate may be adapted to accommodate the other plastic infiltration unit
20 configurations herein described. In preferred embodiments, the middle plate comprises three or more first and second reception zones, respectively.

The first and second surfaces 152, 154 may oppose one another.

25 Further, the middle plate 150 may have a thickness in a direction z perpendicular to the plane that is substantially the same as the thickness of a deck of the plastic infiltration unit 2 (and also the thickness of the another plastic infiltration unit 2').

In one embodiment, each of the first plurality of pillar-like structures 12 and each of the second
30 plurality of pillar-like structures 12' comprises a first and second plurality of foot portions 16, 16', respectively, wherein the first and second plurality of foot portions 16, 16' have a length in the direction z in which the first and second plurality of pillar-like structures 12, 12' extend. In particular, the middle plate 150 has a thickness in the direction z in which the first and second plurality of pillar-like structures 12, 12' extend that is at least two times the length of the first and second

plurality of foot portions 16, 16'. In this way, in use, the first and second plastic infiltration units are accommodated in the middle plate 150.

5 There is further provided a system (an assembly) comprising a middle plate 150 as described with reference to Figs. 42 to 50, and a first and a second plastic infiltration unit as described with reference to the figures, wherein in an assembled state the second plastic infiltration unit 2' is in an inverted configuration with respect to the first plastic infiltration unit 2 and wherein the middle plate 150 is disposed between the first and the second plastic infiltration unit.

10 In particular, the system comprises a plane of symmetry extending through the plane of the middle plate 150.

In one specific embodiment of the present invention, the plastic infiltration unit 2 has dimensions as follows (see Fig. 33): the side 300 (in the y direction) measures 1200mm, the front 400 (also back) 15 (in the x direction) measure 600mm, the height 500 (in the z direction) of the first plastic infiltration unit in the stack, as for example, depicted in Fig. 33 measures 425mm, the height for incremental plastic infiltration units, that is those plastic infiltration units stacked on another plastic infiltration unit (in other words without a base plate 90) is 400mm.

20 In specific embodiments of the present invention, the plastic infiltration unit is (semi) inspectable according to DN-160. The connector adaptor 110 is in accordance with DN-315 and DN-200 (see Fig. 33). The cut hole 86 in the side plate 80 is in accordance with DN-250.

In the embodiments described herein, reference is made to a plastic infiltration unit having a 25 rectangular deck in the xy plane (see inter alia Fig. 1). Reference is also made to a plastic infiltration unit having a square deck in the xy plane (see Fig. 20). The invention is not limited in this respect. The plastic infiltration unit may have a different geometry other than that shown in the figures and described.

30 The invention is not limited to the embodiments shown and described above.

Claims

- 1 A plastic infiltration unit comprising:
- 5 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,
- 10 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 identical support structures and the plastic infiltration unit can be placed in an interconnected condition, wherein, in
- 15 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.
2. The plastic infiltration unit according to claim 1, wherein the second direction is opposite
- 20 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.
- 25 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 4, wherein, in the interconnected condition, the interaction structures of the plastic infiltration unit are in contact with the reception location in
- 30 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
5 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.

10 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
15 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).

20

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.

25 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.

30 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
5 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 of claims 11 to 154, wherein at least one of the
10 first and second pillar-like support structure comprises a plurality of leg portions arranged in a cluster around a (imaginary) central longitudinal axis extending in a direction in which the at least two support structures extend.
16. The plastic infiltration unit according to claim 14 or 15, wherein each of the plurality of leg
15 portions has a (imaginary) central longitudinal axis in the direction in which the at least two support structures extend.
17. The plastic infiltration unit according to claim 15 or 16, wherein each cluster has its own
(imaginary) central axis, respectively.
20
18. The plastic infiltration unit according to any of claims 15 to 17, wherein each cluster comprises 2 or more leg portions.
19. The plastic infiltration unit according to any of claims 14 to 18, wherein the leg portions are
25 arranged equally spaced around the (imaginary) central longitudinal axis or unequally spaced around the (imaginary) central longitudinal axis.
20. The plastic infiltration unit according to any of claims 1 to 19, wherein at least one of the first and second pillar-like support structure comprises a plurality of leg portions arranged in a
30 cluster around the (imaginary) central longitudinal axis extending in the direction in which the at least two pillar-like support structures extend.
21. A plastic infiltration unit according to any of claims 1 to 20, 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.

5 22. The plastic infiltration unit according to any preceding claim, wherein each of the at least two support structures comprises a plurality of pillars, so that in the interconnected condition a grouped set of pillars has double the number of pillars between two decks than for either the plastic infiltration unit or the identical plastic infiltration unit.

10 23. The plastic infiltration unit according to any of claims 14 to 22, wherein the plurality of leg portions is equal to two or more leg portions.

15 24. 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.

20 25. 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.

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

25 27. The plastic infiltration unit according to any of claims 4 to 26, wherein the interaction structure is a foot portion of the pillar-like structure.

30 28. The plastic infiltration unit according to any of claims 24 to 27, 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.

29. 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.

30. 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.

5 31. The plastic infiltration unit according to any preceding claim, wherein the interaction structure extends beyond the deck.

32. The plastic infiltration unit according to any of claims 3 to 31, wherein the interaction structure comprises a hollow containment structure which extends below the deck in the direction
10 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.

33. The plastic infiltration unit according to any of claims 3 to 32, wherein the interaction
15 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.

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

35. A system (an assembly) comprising at least two plastic infiltration units, the system including a first and a second plastic infiltration unit, wherein each plastic infiltration unit
25 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
30 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.

36. The system according to claim 35, wherein the first and the second plastic infiltration units are identical.

37. 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 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 unit 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.

38. The plastic infiltration unit according to claim 37, wherein the second direction is opposite to the first direction.

39. The plastic infiltration unit according to claim 37 or 38, wherein the at least two pillar-like support structures comprise: a first pillar-like support structure and a second pillar-like support structure.

40. The plastic infiltration unit according to claim 39, wherein 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.

41. The plastic infiltration unit according to claims 37 to 40, 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 around an axis extending through a central region of the plastic infiltration unit in a direction substantially parallel to the direction in which the first and second pillar-like support structures extend, the plastic infiltration unit is stackable on the deck of the identical plastic infiltration unit (and vice versa).
42. The plastic infiltration unit according to any of claims 37 to 41, wherein the first pillar-like support structure and the second pillar-like support structure have the same draft angle.
43. The plastic infiltration unit according to any of claims 37 to 42, wherein the first pillar-like support structure and the second pillar-like support structure have different draft angles, respectively, and wherein, in a stacked position, the first and second pillar-like support structures of the another plastic infiltration unit and the same draft angle as the first and second pillar-like structures of the plastic infiltration unit, respectively.
44. The plastic infiltration unit according to any of claims 37 to 43, 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.
45. The plastic infiltration unit according to any of claims 37 to 44, wherein the first pillar-like support structure and the second pillar-like support structure are conical.
46. The plastic infiltration unit according to any of claims 37 to 45, 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.
47. The plastic infiltration unit according to claim 46, wherein the first and second pillar-like support structures have a common longitudinal axis around which the plurality of leg portions are arranged in a cluster, the common axis extending in the direction in which the at least two pillar-like support structures extend.

48. The plastic infiltration unit of claim 46 or 47, wherein each of the plurality of leg portions has a (imaginary) central longitudinal axis in a direction in which the at least two support structures extend.

5 49. The plastic infiltration unit according to any of claims 46 to 48, wherein the leg portions are arranged equally spaced around the (imaginary) central longitudinal axis.

50. The plastic infiltration unit according to any of claims 46 to 49, wherein the leg portions are arranged non-equally spaced around the (imaginary) central longitudinal axis (common axis).

10

51. A plastic infiltration unit according to any of claims 37 to 50, wherein the plastic infiltration unit is configured so that it can be put in a nested condition with 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.

15

52. The plastic infiltration unit according to any preceding claim, wherein each of the at least two pillar-like support structures comprises a plurality of pillars, so that in the interconnected condition a grouped set (cluster) of pillars has double the number of pillars between two decks compared with the number of pillars extending from the deck of the plastic infiltration unit.

20

53. The plastic infiltration unit according to any of claims 37 to 52, wherein the plurality of leg portions is equal to two or more leg portions, preferably 2, 3 or 4.

25 54. 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 encloses, in the plane of the deck, the areas where the at least two pillar-like structures extend from the deck.

55. The plastic infiltration unit according to any of preceding claims 37 to 54, wherein each of the pillar-like structures comprises an interaction structure, wherein the interaction structure is a foot portion of the pillar-like structure.

30

56. The plastic infiltration unit according to claim 55, 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, 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.

5 57. The plastic infiltration unit according to claim 56, wherein the recess is an opening in the deck which extends at least partially through the deck.

58. The plastic infiltration unit according to claim 57, wherein the recess is an opening in the deck which extends entirely through the deck.

10

59. The plastic infiltration unit according to any of claims 56 to 58, 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.

15 60. The plastic infiltration unit according to any of claims 37 to 59, wherein in the interconnected condition, the foot portions of the another identical plastic infiltration unit are disposed between the leg portions of the plastic infiltration unit.

20 61. The plastic infiltration unit according to any of claims 37 to 60, wherein the plastic infiltration unit is configured to be nested within the another identical plastic infiltration unit, and is configured so that when one of either the plastic infiltration unit or the another identical plastic infiltration unit is rotated by 180 degrees, the plastic infiltration unit can be stacked on the another deck of the another identical plastic infiltration unit and when one of either the plastic infiltration unit or the another identical plastic infiltration unit is rotated by 180 degrees and is inverted, the
25 plastic infiltration unit and the another identical plastic infiltration unit are disposed in the interconnected condition.

30 62. The plastic infiltration unit according to any of claims 37 to 61, wherein, in the plane of the deck, the plastic infiltration unit includes a first sector (half) in which a first set of clusters are disposed and a second sector (half) adjacent to the first sector (half) in the plane of the deck in which a second set of clusters are disposed.

63. The plastic infiltration unit according to claim 62, wherein the first set of clusters includes 2, 4, 6 or 8 clusters and wherein the second set of clusters includes 2, 4, 6 or 8 clusters, respectively.

64. The plastic infiltration unit according to claim 62 or 63, in which the first set of clusters are arranged in a similar (same) manner as the second set of clusters.

5 65. The plastic infiltration unit according to any of claims 62 to 64, in which, in the plane of the deck, the first four clusters are rotated by 45 degrees with respect to the second four clusters.

66. The plastic infiltration unit according to any of claims 62 to 65, wherein, the arrangement of the first set of clusters in the first sector is the same as the arrangement of the second set of clusters in the second sector.
10

67. The plastic infiltration unit according to any of claims 37 to 66, wherein, in the plane of the deck, the plastic infiltration unit includes a first sector in which a first set of clusters are disposed, a second sector adjacent to the first sector in the plane of the deck in which a second set of clusters are disposed, a third sector adjacent to the second sector in the plane of the deck in which a third set of clusters are disposed and a fourth sector adjacent to the third sector in the plane of the deck in which a fourth set of clusters are disposed.
15

68. The plastic infiltration unit according to claim 67, wherein the first set of clusters and the third set of clusters are arranged in a similar manner and the second set of clusters and the fourth set of clusters are arranged in a similar manner.
20

69. The plastic infiltration unit according to claim 68, wherein the first and third set of clusters are rotated with respect to the second and fourth set of clusters by for example, 90 degrees when each set of clusters comprises 2 pillar-like support structures, 30 degrees when each set of clusters comprises 3 pillar-like support structure and 45 degrees when each set of clusters comprises 4 pillar-like support structures.
25

70. The plastic infiltration unit according to any of claims to any of claims 62 to 69, wherein each set of clusters includes at least two pillar-like support structures, for example, two, three, four or twelve.
30

71. The plastic infiltration unit according to any of claims 62 to 70, wherein each set of clusters includes the same number of pillar-like support structures.

72. The plastic infiltration unit according to any of claims 62 to 71, wherein each set of clusters includes a non-equal number of pillar-like support structures.

5 73. The plastic infiltration unit according to any preceding claim, 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.

10

74. The plastic infiltration unit according to any preceding claim, 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.

15

75. 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.

20

76. A system (an assembly) comprising at least two plastic infiltration units, 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 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,
25 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,
30 wherein the first and second plastic infiltration units 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 of the first plastic infiltration unit and the at least two pillar-like support structures of the second plastic infiltration unit are aligned.

77. The system according to claim 76, wherein the first and the second plastic infiltration units are identical.

78. A geotextile or geomembrane retention clip for retaining a geotextile or a geomembrane on a plastic infiltration unit, the retention clip comprising: an elastically 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.

79. The geotextile or geomembrane retention clip according to claim 78, further comprising a deformable portion.

80. The geotextile or geomembrane retention clip according to claim 78 or 79, wherein the deformable retaining hook comprises at least one tooth portion, preferably two or three teeth portions which extend from the deformable portion.

81. The geotextile or geomembrane retention clip according to any of claims 78 to 80, further comprising a support portion arranged to support a geotextile or geomembrane when it is inserted into the retention clip.

82. The geotextile or geomembrane retention clip according to claim 81, wherein the support extends from the deformable portion and defines a support region in which the geotextile or geomembrane is supported.

83. The geotextile or geomembrane retention clip according to any of claims 78 to 82, wherein the hook is configured so that it extends into the support region.

84. The geotextile or geomembrane retention clip according to any of claims 78 to 83, wherein the deformable portion, the hook and the support portion are arranged such that when a geotextile or geomembrane is inserted into the clip, the clip deforms to allow the geotextile or geomembrane to be inserted and then exerts a force on the geotextile or geomembrane located between the hook and the support portion, to retain the geotextile or geomembrane in position on the support portion.

85. The geotextile or geomembrane retention clip according to any of claims 78 to 84, wherein the hook comprises at least two teeth portions which are arranged so that one is positioned on either side of the support portion.

5 86. The geotextile or geomembrane retention clip according to any of claims 78 to 85, wherein the retaining hook is angled with respect to a direction of insertion of the geotextile or geomembrane so that when the geotextile or geomembrane is inserted in the direction of insertion into the clip, the deformable portion deforms to open the clip to allow the geotextile or geomembrane to be inserted into the clip and does not open when a force is applied in a direction
10 opposite to the insertion direction.

87. The geotextile or geomembrane retention clip according to any of claims 78 to 86, wherein the retaining hook has a negative angle to retain the geotextile in the clip once it has been inserted.

15 88. The geotextile or geomembrane retention clip according to any of claims 78 to 87, wherein in the case where the hook comprises two teeth portions, one tooth portion is arranged to extend from the at least one deformable portion on either sides of the deformable portion or in the case where the hook comprises two deformable portions, one tooth portion is arranged to extend from each of the two deformable portions.

20

89. The geotextile or geomembrane retention clip according to any of claims 78 to 88, wherein the geotextile or geomembrane retention clip is configured so that a reaction force is downward.

90. The geotextile or geomembrane retention clip according to any of claims 78 to 89, wherein
25 the retention clip is at least one of a sheet metal clip and an injection moulded clip.

91. The geotextile or geomembrane retention clip according to any of claims 78 to 90, wherein the geotextile or geomembrane retention clip is a single component.

30 92. A plastic infiltration unit comprising:
a surface on which a geotextile is to be disposed,
and

a geotextile or geomembrane retention clip for retaining the geotextile on the surface according to any of claims 78 to 91, wherein the geotextile retention clip is integrally formed in the plastic infiltration device.

5 93. The plastic infiltration unit according to claim 92, wherein the plastic infiltration device comprises: a deck extending in a plane, the deck having a first surface and a second surface, wherein the first and second surfaces oppose one another, wherein the geotextile is to be disposed on the first surface.

10 94. The plastic infiltration unit according to claim 93, wherein the geotextile retention clip is integrally formed in the first surface.

95. The plastic infiltration unit according to claim 94, wherein an upper surface of the geotextile retention clip is flush with the first surface.

15

96. A plastic side plate for installation on a plastic infiltration unit, the plastic side plate comprising:

a main body,

a connector for connecting the side plate to a plastic infiltration unit,

20 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.

25 97. The plastic side plate according to claim 96, wherein the pipe stopper is detachably connected to the main body with at least one connecting branch, wherein the at least one connecting branch is configured to detach from the main body when the pipe is inserted into the opening, releasing the pipe stopper from the main body in the direction in which the pipe is insertable.

30 98. The plastic side plate according to claim 96 or 97, wherein the pipe stopper is detachably connected at one or two detaching locations to allow the pipe stopper to rotate with respect to the main body.

99. The plastic side plate according to any of claims 96 to 98, wherein the pipe stopper comprises:

a film hinge and a retention hook, wherein the retention hook is arranged to pivot around the film hinge, so that when the pipe is inserted into the opening the retention hook is arranged to retain
5 the pipe.

100. The plastic side plate according to any of claims 96 to 99, wherein the plastic side plate is one of injection moulded, rotomoulded, extruded and blowmoulded.

101. The plastic side plate according to any of claims 96 to 100, wherein the pipe stopper comprises a guide portion located between the film hinge and the retention hook, wherein the guide portion is dimensioned to guide the pipe towards the retention hook as the pipe is inserted into the opening.

102. The plastic side plate according to any of claims 96 to 101, wherein the pipe stopper has a starting position and a stop position.

103. The plastic side plate according to claim 102, wherein in the starting position, the pipe stopper is aligned with the main body.

20

104. The plastic side plate according to claim 102 or 103, wherein in the stop position, the pipe stopper is pivoted with respect to the main body.

105. The plastic side plate according to any of claims 96 to 104, wherein when the pipe is
25 inserted into the opening the retention hook is arranged to pivot to reach the stop position.

106. 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
30 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.

107. The plastic side plate according to claim 106, wherein the at least one cut-out and the at least one guide part are arranged so that when the attachment part is introduced into the cut-out and rotated with respect to the plastic side plate, the connection adapter is received and guided to a position in which the connection adapter is attached to the plastic side plate.

5

108. A connector adapter for connection to a plastic side plate, for example, the plastic side plate according to any of claims 96 to 107, the connection adapter comprising an attachment part for attaching the connection adapter to the plastic side plate, wherein the attachment part is arranged to be received at a cut out and guided to a stop position by a guiding part when the connector adapter is rotated with respect to the plastic side plate.

10

109. The connector adapter according to claim 108, wherein the attachment part comprises a groove for receiving the guiding part.

110. 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.

15

20

111. The middle plate according to claim 110, wherein a force exerted on the first plastic infiltration unit is transferred through the central axes of the first plurality of pillar-like support structures to the central axes of the second plurality of pillar-like support structures.

25

112. The middle plate according to claim 110 or 111, wherein the middle plate has a thickness in a direction perpendicular to the plane that is substantially the same as the thickness of a deck of the plastic infiltration unit.

30

113. The middle plate according to any of claims 110 to 112, wherein each of the first plurality of pillar-like structures and each of the second plurality of pillar-like structures comprises a first and second plurality of foot portions, respectively, wherein the first and second plurality of foot

portions have a length in the direction in which the first and second plurality of pillar-like structures extend, wherein the middle plate has a thickness in the direction in which the first and second plurality of pillar-like structures extend that is at least two times the length of the first and second plurality of foot portions.

5

114. A system (an assembly) comprising a middle plate of any of claims 110 to 113 and a first and a second plastic infiltration unit of any according to any of claims 1 to 72, 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.

10

115. The system according to claim 114, comprising a plane of symmetry extending through the plane of the middle plate.

15

116. The system according to any of claims 110 to 115, wherein the first and second surfaces oppose one another.