providing a temporary form for the insertion of cementitious material for the forming of a hardened pile for structural load support. The prior art shells are not extensible and thus do not exhibit properties that allow them to engage the surrounding soil through lateral deformations. Further, because they relate to the use of ferrous materials, which are subject to corrosion, their function is complete once the concrete infill hardens. Thus, the prior art shells are not suitable for containing less expensive granular infill materials such as sand or aggregate, because the prior art shells cannot laterally contain the inserted materials during the life of the pier. The prior art shells are also not permeable and are thus ill-suited to drain cohesive soils.

[0006] Accordingly, it is desirable to provide improved techniques for constructing a shallow support pier in soil or the ground using extensible shells formed of relatively permanent material of a substantially non-corrosive or non-degradable nature for the containment of compacted aggregate therein.

[0007] It is further desirable to provide an embodiment and techniques for constructing a ductile support pier in soil or the ground wherein the pier can deform elasto-plastically without rupture.

SUMMARY OF THE INVENTION

[0007a] There is provided an extensible shell for constructing a ductile support pier in ground, the extensible shell defining an interior for holding granular construction material and defining a first end having a first opening therethrough for receiving the granular construction material into the interior and an opposing second end having an end closed by a cap.

[0007b] There is also provided a system for installing ductile support piers in ground, the system comprising:

an extensible shell defining an interior for holding granular construction material and defining a first end having a first opening therethrough for receiving the granular construction material into the interior and an opposing second end having an end closed by a cap;

a driving mandrel for nesting in to the extensible shell, the driving mandrel further comprising a removable driving collar for using in driving the nested extensible shell, and a removable pin.

[0007c] According to an aspect of the present invention, there is provided a method for constructing a ductile support pier in ground, the method comprising:

positioning an extensible shell for driving into ground, the shell defining an interior for holding granular construction material and defining a first end having a first opening therethrough for receiving the granular construction material into the interior and an opposing second end having an end closed by a cap;

inserting a driving mandrel into the shell, the driving mandrel further comprising a removable driving collar for using in driving the nested extensible shell, and a removable pin;

driving the shell into the ground using the driving mandrel;

removing the driving collar and continuing to drive the mandrel such that the shell cap is removed;

filling the shell with granular construction material;

compacting the granular construction material such that a bottom bulb is formed beneath the shell as driven into the ground;

raising the mandrel out of the shell while simultaneously adding additional granular construction material to fill the shell and form a ductile pier.

[0008] Extensible shells and related methods for constructing a support pier in ground are disclosed. An extensible shell may define an interior for holding granular construction material and may define an opening for receiving the granular construction material into the interior. The shell may be flexible such that the shell expands laterally outward when granular construction material is compacted in the interior of the shell.

[0009] According to one embodiment, the shell may include a first end that defines the opening. The shell may be shaped to taper downward from the first end to an opposing second end of the shell.

[0010] According to another embodiment, the second end of the shell may define a substantially flat, blunt surface.

[0011] According to yet another embodiment, a cross-section of the shell may form one of a substantially hexagonal shape and a substantially octagonal shape along a length of the shell extending between the first and second ends.

[0012] According to a further embodiment, a cross-section of the first end of the shell is sized larger than a cross-section of the second end.

CLAIMS

What is claimed:

1. A method for constructing a ductile support pier in ground, the method comprising:

positioning an extensible shell for driving into ground, the shell defining an interior for holding granular construction material and defining a first end having a first opening therethrough for receiving the granular construction material into the interior and an opposing second end having an end closed by a cap;

inserting a driving mandrel into the shell, the driving mandrel further comprising a removable driving collar for using in driving the nested extensible shell, and a removable pin;

driving the shell into the ground using the driving mandrel;

removing the driving collar and continuing to drive the mandrel such that the shell cap is removed;

filling the shell with granular construction material;

compacting the granular construction material such that a bottom bulb is formed beneath the shell as driven into the ground;

raising the mandrel out of the shell while simultaneously adding additional granular construction material to fill the shell and form a ductile pier.

2. The method of claim 1, wherein the cap of the extensible shell is integral to the shell.

3. The method of claim 1, wherein the cap of the extensible shell is removable.