CLAIMS

1. A concrete variable cross-section prefabricated pile, comprising a pile body with large-section segments and small-section segments alternately arranged in a longitudinal direction, the cross-section of the large-section segment and a cross section of the small-section segment are substantially rectangular; wherein a lateral transition surface is formed between the side surfaces of the large-section segment and the adjacent small-section segment; wherein at least a part of the lateral transition surfaces have front edges and/or rear edges, the lateral projection of the front edges and/or rear edges are deviated from the vertical direction, and a vertical projection of the intersection line between the lateral transition surface and a first horizontal plane is located outside a vertical projection of the intersection line between the lateral transition surface and a second horizontal plane; wherein the first horizontal plane is an upper horizontal plane among any of two horizontal planes, and the second horizontal plane is a lower horizontal plane among two horizontal planes; wherein one or both side surfaces of the small-section segment are perpendicular to the bottom surface of the small-section segment or are inclined to the inside of the pile body from top to bottom at a set angle.

2. The concrete variable cross-section prefabricated pile according to claim 1, wherein a front edge and/or a rear edge of the lateral transition surface deviating from the vertical direction in lateral projection is an inclined edge or a curved edge.

3. The concrete variable cross-section prefabricated pile according to claim 1 or 2, wherein a front edge and a rear edge of the side surface of the large-section segment between the two ends are vertical edges, and a surface width thereof remains constant from top to bottom; or the front edge and/or the rear edge of the side surface of the large-section segment between the two ends are deviated from the vertical direction in the lateral projection, and its surface width increases or decreases from top to bottom.

4. The concrete variable cross-section prefabricated pile according to claim 1 or 2, wherein the lateral transition surface comprises a first transition surface located at the front of the small-section segment and a second transition surface located at the rear of the small-section segment, a rear edge of the first transition surface is inclined or curved forward from top to bottom; and/or a front edge of the second transition surface is inclined or curved backward from top to bottom.

5. The concrete variable cross-section prefabricated pile according to claim 1 or 2, wherein the lateral transition surface comprises a first transition surface located at the front of the small-section segment and a second transition surface located at the rear of the small-section segment, a front edge of the first transition surface is inclined or curved forward from top to bottom; and/or a rear edge of the second transition surface is inclined or curved backward from top to bottom.

6. The concrete variable cross-section prefabricated pile according to claim 1, wherein the lateral transition surface is a plane, a front edge of the lateral transition surface is parallel to a rear edge of the lateral transition surface, and a surface width remains constant from top to bottom; or the lateral transition surface is a plane, the front edge and rear edge of the lateral transition surface are not parallel, and the surface width increases or decreases from top to bottom; or

the lateral transition surface is a curved surface, the front edge of the lateral transition surface is parallel to the rear edge of the lateral transition surface, and the surface width remains constant from top to bottom; or the lateral transition surface is a curved surface, the front edge and rear edge of the lateral transition surface are not parallel, and the surface width increases or decreases from top to bottom.

7. The concrete variable cross-section prefabricated pile according to claim 6, wherein the lateral transition surface is a concave curved surface, a convex curved surface or a twisted surface.

8. The concrete variable cross-section prefabricated pile according to claim 7, wherein the concave curved surface comprises a concave arc surface or a concave conical surface, and the convex curved surface comprises a convex arc surface or a convex conical surface.

9. The concrete variable cross-section prefabricated pile according to claim 1, wherein an extension line of a vertical projection of an intersection line between the lateral transition surface and the first horizontal plane intersects with an extension line of the vertical projection of an intersection line between the lateral transition surface and the second horizontal plane.

10. The concrete variable cross-section prefabricated pile according to claim 1, wherein the pile body has pile end faces, at least one pile end face has a groove and a plurality of connecting holes being arranged at intervals; wherein the groove is configured to at least partially accommodate a storage block in which the viscous substance is stored, a depth of the groove is less than an initial height of the storage block; wherein when the prefabricated square piles are butted together, the storage block is compressed so as to release a viscous substance to eliminate and/or fill the gaps at the end faces of the butted prefabricated square piles.

11. The concrete variable cross-section prefabricated pile according to claim 10, wherein a groove depth of the groove is greater than or equal to 1mm, a groove width of the grove is greater than or equal to 1mm, and the groove is more than 0.5cm away from the connecting hole.

12. The concrete variable cross-section prefabricated pile according to claim 11, wherein the groove depth of the groove is 2mm-20mm.

13. The concrete variable cross-section prefabricated pile according to claim 10, wherein at least one of the grooves is circular or annular or rectangular or regular polygon and located at the center of the pile end face;

and/or, at least one of the grooves is annular and surrounds all connecting holes;

and/or, at least one of the grooves is annular and surrounds part of the connecting holes;

and/or, at least one of the grooves is annular and surrounds a single connecting hole.

14. The concrete variable cross-section prefabricated pile according to claim 1 or 10, wherein a rigid skeleton of the concrete variable cross-section prefabricated pile comprises: a main reinforcement skeleton with a plurality of main reinforcements being arranged at intervals and wound to form a reserved cavity, and a skeleton stirrup which ferrules the main reinforcement skeleton;

wherein the ends of the main reinforcement skeletons are bound with rigid mesh enclosures and/or rigid meshes to enhance the structural strength of the prefabricated piles, the ends of the main reinforcement skeleton are ferruled and fixed by auxiliary stirrups, and a winding interval of the auxiliary stirrups is less than or equal to a winding interval of the skeleton stirrups.

15. The concrete variable cross-section prefabricated pile according to claim 14, wherein the auxiliary stirrups form a stirrup dense zone, and a length of the stirrup dense zone is greater than a length of the large-section segment at the end; wherein a winding density of the stirrup dense zone is 1.5-3 times than a winding density of the non-dense zone.

16. The concrete variable cross-section prefabricated pile according to claim 14, wherein a plurality of C-shaped ferrules with openings facing the middle of the reserved cavity are further provided at the end faces of the main reinforcement skeleton.

17. The concrete variable cross-section prefabricated pile according to claim 14, 15 or 16,

wherein connecting nuts are connected to the end of the main reinforcement, and the auxiliary stirrup is connected and fixed with at least one of the connecting nuts.

18. The concrete variable cross-section prefabricated pile according to claim 16, wherein the C-shaped ferrules are arranged at intervals in the reserved cavities of the main reinforcement skeleton in sequence in the transverse or longitudinal direction; and/or the C-shaped ferrules are arranged crosswise in the reserved cavity of the main reinforcement skeleton; wherein the C-shaped ferrules are fixedly connected with the auxiliary stirrup or/and the rigid mesh enclosure.

19. The concrete variable cross-section prefabricated pile according to claim 14, wherein the auxiliary stirrup and the rigid mesh enclosure are connected and fixed, and the rigid mesh enclosure is located inside the auxiliary stirrup;

or the rigid mesh enclosure includes a plurality of annular reinforcements arranged in sequence along the length of the main reinforcement skeleton at intervals and a plurality of axial reinforcements for connecting and fixing the annular reinforcements; wherein the axial reinforcements are parallel to the main reinforcements;

or the rigid meshes are arranged at the ends of the main reinforcement skeleton and arranged at intervals along the length direction of the reserved cavity.

20. The concrete variable cross-section prefabricated pile according to claim 14, wherein a length of the large-section segment at both ends of the pile body is greater than a length of the large-section segment in the middle part, the length of the large-section segment at both ends of the pile body is 2 to 6 times the length of the large-section segment in the middle part;

and/or on the cross section of the small-section segment, a cross-sectional area of the small-section segment is S1, a sum of the cross-sectional areas of steel bars is S2, wherein a ratio of S2 to S1 is at least 0.5% to 0.15%.