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Geosynthetics - Plastic geocell

土工合成材料 塑料土工格室

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3 Terms and definitions

3.1 Plastic geocell: a three-dimensional grid structure formed by joining strips made of plastic by various processes, which when opened out takes the form of a quadrilateral or polygonal honeycomb. Note: a single set of plastic geocell is shown in Figure 1, whose key identifies the junction at the middle of the strip between cells, the junction at the edge of the strip between cells, the nominal cell length, the nominal cell width, the cell height, which is the strip width, and the edge length and edge width of a single set of plastic geocell when fully opened out.

3.2 Fixed angle connection junctions: a junction at which the initial angle between the two adjacent strips is 90° before the plastic geocell is opened out. Note 1: the structure is shown in Figure 2. Note 2: rounding the fixed-angle junction with an arc helps to reduce the stress concentration caused by a sharp junction angle.

3.3 Unfixed angle connection junctions: a junction at which the initial angle between the two adjacent strips is 0° before the plastic geocell is opened out. Note: the structure is shown in Figure 3.

4 Classification and designation

4.1.1 Plastic geocells are classified by the raw material of the strip, the strip production process, the junction structure, the junction strength and the preset initial angle at the junction.

4.1.2 By raw material of the strip they are divided into polyethylene, polypropylene and polyester geocells.

4.1.3 By strip production process they are divided into the extruded type (E) and the stretched type (S).

4.1.4 By junction structure they are divided into the welded type (WC), the micro-pile fusion type (WZ), the injection moulded type (IC), the mortise and tenon type (MT) and the ring insert type (PC). Common junction structures are given in Annex A.

4.1.5 By junction strength, welded, micro-pile fusion, injection moulded and mortise and tenon plastic geocells are divided into types I, II, III, IV and V, and ring insert plastic geocells into types VI and VII.

4.1.6 By preset initial angle at the junction they are divided into the fixed-angle type and the unfixed-angle type.

4.2 Designation. The designation is built from the abbreviation of the raw material of the strip, the strip production process, the junction structure, the junction strength grade, the cell height, the nominal cell length, the nominal cell width and the preset initial angle at the junction, in the pattern: plastic geocell code, strip raw material abbreviation, strip production process, junction structure, junction strength grade, cell height, nominal cell length by nominal cell width, preset initial angle at the junction. Where the nominal cell length and the nominal cell width are the same, only one value is written. The code for a plastic geocell is GC. The abbreviations of the strip raw materials follow GB/T 1844.1-2022: PP for polypropylene, PE for polyethylene, PET for polyester. The cell height, the nominal cell length and the nominal cell width are nominal dimensional values in millimetres and the preset initial angle at the junction is in degrees. The listed values for each position are: the code GC; the strip raw material PE, PP or PET; the production process E for extruded and S for stretched; the junction structure WC for welded, WZ for micro-pile fusion, IC for injection moulded, MT for mortise and tenon, PC for ring insert and OT for other; and the junction strength grades I to VII.

Example 1: GC-PP-S-IC-V-50-400-90 denotes a plastic geocell (GC) with a stretched strip of polypropylene (PP), an injection moulded junction structure, junction strength grade V, a cell height of 50 mm, a nominal cell length of 400 mm, a nominal cell width of 400 mm and a preset initial angle at the junction of 90°.

Example 2: GC-PE-E-WC-I-200-400-0 denotes a plastic geocell (GC) with an extruded strip of polyethylene (PE), a welded junction structure, junction strength grade I, a cell height of 200 mm, a nominal cell length of 400 mm, a nominal cell width of 400 mm and a preset initial angle at the junction of 0°.

5 Materials

5.1 Base resin. Of the base resins used as the raw material of the plastic geocell strip, polyethylene shall meet GB/T 11115, polypropylene shall meet GB/T 12670 and polyester shall meet GB/T 17931.

5.2 Junction connectors. Plastic connectors with resistance to ageing may be used at the junctions of a plastic geocell, and metal connectors may also be used; the surface quality of a metal connector shall meet the surface treatment requirements of 6.4.2 of GB/T 27704-2011.

6 Requirements

6.1 Appearance. Table 1 has three columns, the item number, the item and the requirement, and covers three items. For the strip, the colour shall be even and the surface flat and free of bubbles, and holes or embossing may be made as required. For the junction, the requirement depends on the junction type: welded junctions shall be neatly arranged and free of detachment; micro-pile fusion junctions shall be neatly arranged and free of detachment; injection moulded junctions shall be even, free of short shots, bubbles and shrinkage distortion; mortise and tenon junctions shall grip the geocell strip firmly and be free of looseness and detachment; and ring insert junctions shall have the port of the insert closed with no opening. For the grid, the cell dimensions after opening out shall be even and the junctions free of missed connections and of detachment.

6.2 Dimensions and deviations. The opened-out dimensions of a single set of plastic geocell preferably are not smaller than 4 m by 5 m, and other opened-out dimensions may be agreed between supplier and purchaser. The dimensions and deviations of the plastic geocell shall meet Table 2, which fixes, against a cell height of 100 mm or less and a cell height of more than 100 mm, the tolerance on the cell height, a minimum strip thickness for the extruded type and for the stretched type, the nominal cell length and width range with a deviation for the extruded type and a deviation for the stretched type, and the nominal value and the tolerance of the preset initial angle at a fixed-angle junction. In the extracted text of Table 2 the cells of the strip thickness, cell dimension and junction angle columns cannot be attributed to either of the two cell height rows, so the numerical values of that table are not reproduced here.

6.3 Properties of the plastic geocell strip. Table 3 lists nine test items against six columns of raw material and production process, namely extruded and stretched polyethylene, extruded and stretched polypropylene, and extruded and stretched polyester. The items are tensile strength in kilonewtons per metre; tensile yield strain and tensile strain at break, both as a percentage; carbon black content as a percentage and carbon black dispersion, both applying only to black plastic geocell products to which carbon black has been added; oxidation induction time at 200 degrees Celsius in minutes; tensile load stress cracking in hours; retention of properties after artificial weathering as a percentage, which applies to fields of use such as green slope protection where the product is exposed outdoors for long