

IAPMO IGC 276-2019

Bundled Expanded Polystyrene (EPS) Synthetic Aggregate Systems



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IAPMO Standard

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Expanded Polystyrene (EPS) Synthetic Aggregate Systems

1 Scope

1.1 General

This Standard covers systems consisting of bundled synthetic aggregate made of expanded polystyrene (EPS) intended for use in subsurface drainage applications and specifies requirements for materials, physical characteristics, performance testing, and markings.

1.2 Alternative Materials

The requirements of this Standard are not intended to prevent the use of alternative materials or methods of construction provided such alternatives meet the intent and requirements of this Standard.

1.3 Terminology

In this Standard,

- (a) “shall” is used to express a requirement, i.e., a provision that the user is obliged to satisfy to comply with the Standard;
- (b) “should” is used to express a recommendation, but not a requirement;
- (c) “may” is used to express an option or something permissible within the scope of the Standard; and
- (d) “can” is used to express a possibility or a capability.

Notes accompanying sections of the Standard do not specify requirements or alternative requirements; their purpose is to separate explanatory or informative material from the text. Notes to tables and figures are considered part of the table or figure and can be written as requirements.

1.4 Units of Measurement

SI units are the primary units of record in global commerce. In this Standard, the inch/pound units are shown in parentheses. The values stated in each measurement system are equivalent in application, but each unit system is to be used independently. All references to gallons are to U.S. gallons.

1.5 Amendments

Proposals for amendments to this Standard will be processed in accordance with the standards-writing procedures of IAPMO.

2 Reference Publications

This Standard refers to the following publications and, where such reference is made, it shall be to the current edition of those publications, including all amendments published thereto.

ASTM D1248	Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
ASTM D3786	Standard Test Method for Bursting Strength of Textile Fabrics—Diaphragm Bursting Strength Tester Method
ASTM D4632	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
ASTM D4976	Standard Specification for Polyethylene Plastics Molding and Extrusion Materials
ASTM D6241	Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe
ASTM D6707	Standard Specification for Circular-Knit Geotextile for Use in Subsurface Drainage Applications
ASTM F667	Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings

3 Definitions

The following definitions shall apply in this Standard:

Bundled EPS Synthetic Aggregate System — a cylindrically-shaped unit having an external permeable outer layer that contains EPS synthetic aggregate. The external permeable outer containment layer forms a circumference, and consists of a tubular plastic open encasement comprised of mesh netting or geotextile or combination capable of transmitting water in or out of the product. Bundled EPS synthetic aggregate units may or may not include an internal pipe, depending upon the application. Bundled EPS synthetic aggregate units are designed as an alternate to the standard pipe and gravel system in wastewater, groundwater, and stormwater systems.

Normal Duty H-10 Unit A normal-duty H-10 unit is one or more bundles of EPS synthetic aggregate configured in singular, tangential rows or columns. Units may contain a plastic pipe for longitudinal conveyance of water. “H-10” refers to the 1983, 13th edition of the American Association of State Highway and Traffic Officials (AASHTO) Standard Specifications for Highway Bridges load rating of 71,172 N (16,000 lbs)/axle which the unit can withstand under 305 mm (12 in) of backfill cover. The unit shall be used only under non-traffic areas.

Heavy Duty H-20 Unit A heavy-duty H-20 unit is one or more bundles of EPS synthetic aggregate configured in singular, tangential rows or columns. Bundles may contain a plastic pipe for longitudinal conveyance of water. “H-20” refers to the 1983, 13th edition of the American Association of State Highway and Traffic Officials (AASHTO) Standard Specifications for Highway Bridges load rating of 142,343 N (32,000 lbs)/axle which the unit can withstand with 457 mm (18 in) of backfill cover and may be used under traffic areas.

Internal Coupler An internal coupler is of slightly less diameter than pipe contained within a given EPS synthetic aggregate bundle, and connects adjacent units end-to-end to allow permanent alignment of pipe that extends from one bundle to the next.

End Cap An end cap is a cover that attaches to the terminus of the pipe at the distal end of a trench or line of bundled EPS synthetic aggregate.

4 General Requirements

4.1 General

EPS synthetic aggregate shall uniformly fill the length of the bundle at each end of the bundle. The end of the bundle may be tapered, which is the gradual reduction of bundle diameter, measured from the nominal bundle diameter to either the outside diameter of the pipe or the center of the bundle that does not contain a pipe. The maximum allowable distance that tapering can occur is 25% of nominal bundle diameter, measured from the point of encasement closure. A geotextile can be placed between the EPS synthetic aggregate and permeable outer containment layer.

4.2 Aggregate

4.2.1 EPS Synthetic Aggregate Size

The EPS synthetic aggregate particle shall be relatively uniform in shape and size. The aggregate particle size shall range from 13 mm (0.5 in) to 51 mm (2.0 in) along any axis.

4.2.2 EPS Synthetic Aggregate Density

The EPS synthetic aggregate within each unit shall have a minimum average bulk density of 6.4 kg/m³ (0.40 lbs/ft³).

4.2.3 EPS Synthetic Aggregate Porosity

The EPS synthetic aggregate within each unit shall provide a minimum porosity of 30%.

4.2.4 Extruded and Expanded Polystyrene

Synthetic aggregate shall be comprised of virgin or recycled polystyrene or a mixture of both materials.

4.3 Encasement

The encasement that houses the EPS and pipe shall be tubular plastic open mesh material.

4.3.1 Encasement Materials Containing Factory Seams

Shall be visually inspected for full seam continuity over their full length of the bundle by tensioning the seam using 44.5 N (10 lbs). of force perpendicular to the seam length. A 152 mm (6 in) seam shall be visually inspected on both sides every 1.5 m (5 ft). Seams shall not unravel and no loose edges shall be allowed. Loose threads shall be pulled and shall not cause unraveling. Flaps or flanges extending downward along the exterior of the bundle shall not exceed 25 mm (1 in) adjacent from the seam.

Note: Flaps or flanges which extend more than an inch shall be required to be permanently affixed to the upper 180-degree arc of the bundle during the manufacture of the product.

4.3.2 Wastewater Applications

Encasement for wastewater applications shall either be open mesh net or a combination of net and geotextile.

- (a) The net shall have a minimum rupture energy of 20 N·m (15 ft·lbf) per ASTM D4632.
- (b) The minimum knot size shall be 6.4 mm (0.25 in).
- (c) The geotextile shall be knitted, woven, or non-woven with a minimum puncture force of:
 - (i) 667 N (150 lbf) per ASTM D6241 for the knitted type or,
 - (ii) 827 kPa (120 psi) per ASTM D3786 for the woven or non-woven type.

4.3.3 Stormwater and Underground Applications

Encasement for stormwater and groundwater applications shall be:

- (a) Either knitted, woven or non-woven geotextile with a minimum puncture force of 667 N (150 lbf) per ASTM D6241 for the knitted type or:
- (b) 827 kPa (120 psi) per ASTM D3786 for the woven or non-woven type.
- (c) The minimum weight per unit area shall be 68 g/m² (2.0 oz/yd²).

4.3.4 Manufacturing Material

Encasement shall be manufactured from either:

- (a) Virgin high-density polyethylene (HDPE) shall meet requirements specified by ASTM D4976, PE 245.
- (b) Virgin polypropylene, recycled polypropylene, recycled HDPE, and other additives, which in combination yields properties equivalent to HDPE in conformance with ASTM D4976, PE 245,
- (c) Virgin Polyester in conformance with ASTM D6707, type "A" fabrics

4.4 Geotextile

4.4.1 Materials

Geotextile material that is used as a barrier between the EPS synthetic aggregate and the soil and is not part of the encasement material shall either be knitted, woven, or non-woven with a minimum weight of 17 g/m² (0.5 oz/yd²).

4.4.2 Placement

When supplied for wastewater applications, the geotextile shall span a minimum of 120 degrees to a maximum of 180 degrees across the top of the bundle. When supplied for stormwater and groundwater applications, the geotextile may encompass the entire circumference of the bundle.

4.5 Pipe

4.5.1 Manufacturing Material

When supplied, pipe shall be manufactured from either;

- (a) Virgin high density polyethylene (HDPE); in conformance with the requirements of Grade P14 Class C, Grade P23 Class C, Grade P33 Class C, or Grade P34 Class C as defined and described in ASTM D1248; or,
- (b) Recycled HDPE, and other additives, which in combination yields properties equivalent to HDPE, Grade P14 Class C, Grade P23 Class C, Grade P33 Class C, or Grade P34 Class C as defined and described in ASTM D 1248.

4.5.2 Perforated Pipe

Perforated pipe shall be used for septic leach disposal system applications. Where pipe is used within bundled EPS synthetic aggregate units, it shall be perforated and meet the materials, marking dimensions, workmanship, elongation, brittleness, pipe stiffness, and perforation requirements specified in ASTM F667.

4.5.3 Slotted Pipe

Slotted pipe shall be used for groundwater and stormwater applications. Where pipe is used within bundled EPS synthetic aggregate units, it shall be slotted and meet the materials, marking dimensions, workmanship, elongation, brittleness, pipe stiffness, and perforation requirements specified in ASTM F667.

4.5.4 Pipe Protuberance

To minimize the gap between the bundled EPS synthetic aggregate units connected end to end, the pipe shall not extend more than 38 mm (1.5 in) beyond the point of encasement closure.

4.6 Internal Couplers and End Caps

Internal couplers and end caps shall be manufactured using blow molding, or a gas or pressure assisted or structural foam injection molding process, and shall meet the materials, marking dimensions, workmanship, elongation, brittleness, and pipe stiffness requirements for fittings per ASTM F667

5 Testing Requirements

5.1 Load Rating

5.1.1 Test set-up

The load rating test set-up shall be as follows:

- (a) Place an assembly that consists of three 305 mm (12 in) diameter, minimum 1.5 m (5 ft)-long bundled EPS units arranged side by side in a 914 mm (36 in) wide trench as shown in Figure 1
- (b) The center bundled EPS unit shall contain a pipe and the outer units shall contain aggregate only.
- (c) Connect another assembly of bundled EPS units to the above assembly so that both are connected in an end-to-end arrangement within the 914 mm (36 in)-wide trench.
- (d) Burry both assemblies of bundled EPS units with clean soil free of large stones, boulders or other materials that could damage the units.
- (e) One end of the set-up shall be left open for observation and evaluation.
- (f) The bundled EPS units shall be buried in accordance with the manufacturer's instructions with a compacted cover of the following depth:
 - (i) 305 mm (12 in) for H-10; and,
 - (ii) 457 mm (18 in) for H-20.