Designation: D7258 – 23

Standard Specification for Polymeric Piles[1]

This standard is issued under the fixed designation D7258; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This specification addresses the use of round and rectangular cross-section polymeric piles in axial and lateral load-bearing applications, including but not limited to marine, waterfront, and corrosive environments.

1.2 This specification is only applicable to individual polymeric pile products. Sheet pile and other mechanically connected polymeric pile products using inter-locking systems, are not part of this specification.

1.3 The piling products considered herein are characterized by the use of polymers, whereby *(1)* the pile strength or stiffness requires the inclusion of the polymer, or *(2)* a minimum of fifty percent (50 %) of the weight or volume is derived from the polymer. The type classifications of polymeric piles described in Section 4 show how they can be reinforced by composite design for increased stiffness or strength.

1.4 This specification covers polymeric piles fabricated from materials that are virgin, recycled, or both, as long as the finished product meets all of the criteria specified herein. Diverse types and combinations of inorganic filler systems are permitted in the manufacturing of polymeric piling products. Inorganic fillers include such materials as talc, mica, silica, wollastonite, calcium carbonate, etc. Pilings are often placed in service where they will be subjected to continuous damp or wet exposure conditions. Due to concerns of water sensitivity and possible affects on mechanical properties in such service conditions, organic fillers, including lignocellulosic materials such as those made or derived from wood, wood flour, flax shive, rice hulls, wheat straw, and combinations thereof, are not permitted in the manufacturing of polymeric piling products.

1.5 The values are stated in inch-pound units as these are currently the most common units used by the construction industry.

1.6 Polymeric piles under this specification are designed using design stresses determined in accordance with Test Methods D6108, D6109, and D6112 and procedures contained within this specification unless otherwise specified.

1.7 Although in some instances it will be an important component of the pile design, frictional properties are currently beyond the scope of this document.

1.8 Criteria for design are included as part of this specification for polymeric piles. Certain Types and sizes of polymeric piles will be better suited for some applications than others. Polymeric piles designed and manufactured under the different Type classifications as defined within this specification will, as a whole, exhibit a wide-range of mechanical properties. For example, a 10-in. diameter Type II, chopped glass fiber reinforced high-density polyethylene (HDPE) pile will likely have an apparent stiffness much different than a 10-in. diameter Type V, glass fiber reinforced composite tube filled with concrete. Similarly, the ultimate moment capacity of these two example piles will also likely be significantly different from each other. Use of a licensed Professional Engineer is, therefore, highly recommended for designing and selecting polymeric piles in accordance with this specification.

1.9 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—There is no known ISO equivalent to this specification.

1.10 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D883 Terminology Relating to Plastics

D1141 Practice for Preparation of Substitute Ocean Water

[1] This specification is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.20 on Plastic Lumber.

Current edition approved Feb. 1, 2023. Published February 2023. Originally approved in 2009. Last previous edition approved in 2017 as D7258 – 17. DOI: 10.1520/D7258-23.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard**

D2344/D2344M Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates
D2915 Practice for Sampling and Data-Analysis for Structural Wood and Wood-Based Products
D5033 Guide for Development of ASTM Standards Relating to Recycling and Use of Recycled Plastics (Withdrawn 2007)[3]
D6108 Test Method for Compressive Properties of Plastic Lumber and Shapes
D6109 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastic Lumber and Related Products
D6112 Test Methods for Compressive and Flexural Creep and Creep-Rupture of Plastic Lumber and Shapes
D6341 Test Method for Determination of the Linear Coefficient of Thermal Expansion of Plastic Lumber and Plastic Lumber Shapes Between –30 and 140°F (–34.4 and 60°C)
D6662 Specification for Polyolefin-Based Plastic Lumber Decking Boards
E84 Test Method for Surface Burning Characteristics of Building Materials
E176 Terminology of Fire Standards

2.2 *Other Documents:*
ASCE 7 Minimum Design Loads for Buildings and Other Structures[4]
AASHTO GSDPB-1 Standard Specification for Design of Pedestrian Bridges[5]
AASHTO HB-13 Standard Specification for Highway Bridges[5]
Department of Defense Unified Facility Criteria UFC 4-152-01 Design: Piers and Wharves, Naval Facilities Engineering Command, Washington DC

3. Terminology

3.1 *Definitions of Terms:*

3.1.1 For definitions of terms used in this specification associated with plastics issues refer to the terminology contained in Terminology D883. For definitions of terms used in this specification and associated with fire issues refer to the terminology contained in Terminology E176. Additional definitions of terms applying to this specification appear in Guide D5033.

3.1.2 *plastic lumber, n*—a manufactured product made primarily from plastic materials (filled or unfilled), typically used as a building material for purposes similar to those of traditional lumber, which is usually rectangular in cross-section. **D883**

3.1.2.1 *Discussion*—Plastic lumber is typically supplied in sizes similar to those of traditional lumber board, timber and dimension lumber; however the tolerances for plastic lumber and for traditional lumber are not necessarily the same. **D883**

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *axial load-bearing pile, n*—a vertical or battered member driven into the ground to help support a load of any structure bearing upon it. Axial load-bearing piles are commonly divided into two kinds; point-bearing (end-bearing) and friction. A point-bearing pile derives practically all its support from the rock or soils near the point and much less from contact with soil along the pile shaft. A friction pile derives its support principally from the soil along the pile shaft through the development of shearing resistance between the soil and the pile.

3.2.2 *lateral load-bearing pile, n*—a vertical or battered member driven into the ground to resist lateral loads imposed upon it or a structure. A common application for a lateral load-bearing pile is to absorb lateral forces at points of impact and dissipate them horizontally into a structure and/or soil stratum. A fender pile is an example of a lateral load-bearing pile.

3.2.3 *combined axial and lateral load-bearing pile, n*—a vertical or battered member driven into the ground to resist both axial and lateral loads or applied external forces imposed upon it. Combined axial and lateral load-bearing piles are commonly divided into two kinds; point-bearing (end-bearing) and friction. A point-bearing pile derives practically all its support from the rock or soils near the point and much less from contact with soil along the pile shaft. A friction pile derives its support principally from the soil along the pile shaft through the development of shearing resistance between the soil and the pile.

4. Classification

4.1 Polymeric Piles contained in this specification are classified as following six (6) types:

4.1.1 *Type I*—Polymeric only.

4.1.2 *Type II*—Polymeric with reinforcement in the form of chopped, milled or continuous fiber or mineral.

4.1.3 *Type III*—Polymeric with reinforcement in the form of metallic bars, cages, or shapes.

4.1.4 *Type IV*—Polymeric with reinforcement in the form of non-metallic bars or cages.

4.1.5 *Type V*—Polymeric composite tube with a concrete core.

4.1.6 *Type VI*—Any other polymeric piling meeting the requirements in 1.3 and not otherwise described by Types I through V above.

5. Ordering Information

5.1 The purchaser shall state whether this specification is to be used, select the preferred options permitted herein, and include the following information in the invitation to bid and purchase order:

5.1.1 Title, number and date of this specification,

5.1.2 Type and composition,

5.1.3 Percent recycled content (if requested),

5.1.4 Flame spread index, if applicable,

5.1.5 Color,

5.1.6 Quantity in linear feet (meters), and minimum length without splices,

[3] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from American Society of Civil Engineers (ASCE), 1801 Alexander Bell Dr., Reston, VA 20191, http://www.asce.org.

[5] Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001, http://www.transportation.org.