



Designation: D7568 – 23

Standard Specification for Polyethylene-Based Structural-Grade Plastic Lumber for Outdoor Applications¹

This standard is issued under the fixed designation D7568; 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 covers a type of plastic lumber product, defined as polyethylene-based structural-grade plastic lumber (SGPL), for use as main framing members, including joists, stringers, beams, columns; and secondary framing members, including planking, posts and bracing; in outdoor structures such as decks, boardwalks, docks, and platforms.

1.2 This specification is applicable to solid, rectangular SGPL products where polyethylene resin (non cross-linked) is the continuous phase and is at least 50 % of the product (by weight).

1.3 This specification is not applicable to plastic lumber products containing cellulosic materials as additives, fillers or fiber reinforcements.

1.4 SGPL products covered by this specification shall not be used as tensile members.

1.5 SGPL products are produced using several different manufacturing processes. These processes utilize a number of polyethylene resin material systems that include varying proportions of fillers, fiber reinforcements, and other chemical additives.

1.6 Due to thermodynamic effects that result in outer-surface densification during manufacture, SGPL products are typically non-homogeneous in the cross-section. This standard does not address materials that have been modified from their original cross-section.

1.6.1 The cross-section non-homogeneity is addressed in the material property assessments in this document only for applications in which the product cross-section is not modified by cutting, notching, or drilling. For products modified in this manner, additional engineering considerations are required and they are beyond the scope of this document.

1.7 For purposes of this standard, an SGPL product is a specific combination of polyethylene resin, together with

fillers, reinforcements, and additives. Each formulation is to be identified as a distinct and different product, to be tested and evaluated separately.

1.8 Diverse and multiple combinations of both virgin and recycled polyethylene material systems are permitted in the manufacture of SGPL products.

1.9 Fiber reinforcements used in SGPL include manufactured materials such as fiberglass (chopped or continuous), carbon, aramid and other polymeric materials.

1.10 A wide variety of chemical additives are typically added to SGPL formulations. Examples include colorants, chemical foaming agents, ultraviolet stabilizers, fire retardants, lubricants, anti-static products, heat stabilizers, and coupling agents.

1.11 Diverse types and combinations of filler systems are permitted in the manufacturing of SGPL products. Fillers that cause the product to fail the requirements of 6.13 are not permitted in the manufacturing of SGPL products.

1.12 In order for a product to be classified as SGPL, it must meet the minimum stress and modulus criteria consistent with the specific product as marked, and additionally the properties specified in Section 6 of this specification.

1.13 This specification pertains to SGPL where any reinforcement is uniformly distributed within the product. When reinforcement is not uniformly distributed, the engineering issues become substantially more complex. For this reason, such products are not covered in this document.

1.14 Products that fail at strains of less than 0.02 (2 %) when tested in flexure in accordance with 6.6 are not compatible with the underlying assumptions of Annex A1 and are beyond the scope of this standard (see Note 1).

NOTE 1—Calculation of time-dependent properties in Annex A1 is based on the assumption that the product does not fail in a brittle manner. The 2 % strain limit was selected based on the judgment of the task group members that created Annex A1.

1.15 This specification addresses issues relevant to a buyer's requirements for SGPL products and has therefore been developed in the format of a procurement specification.

1.16 Criteria for design are included as part of this specification for SGPL products.

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.

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1.17 Use of SGPL members in application will typically require the design of structural connections. Connection design between SGPL members falls outside the scope of this standard.

1.18 The values are stated in inch-pound units, as these are currently the most common units used by the US construction industry. Equivalent SI units are indicated in parentheses.

1.19 *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 2—There is no known ISO equivalent to this standard.

1.20 *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 The following documents of the issue in effect on the date of product purchase form a part of this specification to the extent referenced herein:

2.2 ASTM Standards:²

D883 Terminology Relating to Plastics

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

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

D7032 Specification for Establishing Performance Ratings for Wood-Plastic Composite and Plastic Lumber Deck Boards, Stair Treads, Guards, and Handrails

E84 Test Method for Surface Burning Characteristics of Building Materials

E176 Terminology of Fire Standards

2.3 Other Documents:

ASCE 7 Minimum Design Loads for Buildings and Other Structures³

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**.

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. (Terminology **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. (Terminology **D883**)

3.1.3 *resin, n*—a solid or pseudo solid organic material often of high molecular weight, which exhibits a tendency to flow when subjected to stress, usually has a softening or melting range, and usually fractures conchoidally (Terminology **D883**).

3.1.3.1 *Discussion*—In a broad sense, the term is used to designate any polymer that is a basic material for plastics.

3.1.4 *thermoplastic, n*—a plastic that repeatedly can be softened by heating and hardened by cooling through a temperature range characteristic of the plastic, and that in the softened state can be shaped by flow into articles by molding or extrusion (Terminology **D883**).

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *bulge, n*—convex distortion (away from the center of the cross-section) of the face of the product from a straight line drawn from edge to edge across the width.

3.2.2 *crook, n*—distortion of the product in which there is a deviation in a direction perpendicular to the edge from a straight line from end to end along the length.

3.2.3 *cup, n*—concave distortion (towards the center of the cross-section) of the face of the product from a straight line drawn from edge to edge across the width.

3.2.4 *edge, n*—the side of a rectangular-shaped product corresponding to the thickness.

3.2.5 *face, n*—the side of a product corresponding to the width.

3.2.6 *reinforcement, n*—a material added to the thermoplastic resin to improve its mechanical properties.

3.2.7 *self-supporting specimen, n*—a specimen that remains in place by its own structural characteristics both before and during a fire test.

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.

³ Available from American Society of Civil Engineers (ASCE), 1801 Alexander Bell Dr., Reston, VA 20191, <http://www.asce.org>.