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Standard Specification for
Polyolefin Chopped Strands for Use in Concrete[1]

This standard is issued under the fixed designation D7508/D7508M; 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 polyolefin chopped strands (fibers) for use in concrete.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.3 The following safety hazards caveat pertains only to the test methods described in this specification: *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 and health practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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]
C1116/C1116M Specification for Fiber-Reinforced Concrete
D123 Terminology Relating to Textiles
D1577 Test Methods for Linear Density of Textile Fibers
D1776 Practice for Conditioning and Testing Textiles
D1907 Test Method for Linear Density of Yarn (Yarn Number) by the Skein Method
D2256 Test Method for Tensile Properties of Yarns by the Single-Strand Method
D2257 Test Method for Extractable Matter in Textiles
D2258 Practice for Sampling Yarn for Testing
D3218 Specification for Polyolefin Monofilaments

2.2 *Other Documents:*
ICC ES AC32 Acceptance Criteria for Concrete with Synthetic Fibers[3]

3. Terminology

3.1 *Definitions:*
3.1.1 For definitions of terms used in this Specification, refer to Terminology D123.

3.2 *Definitions of Terms Specific to This Standard:*
3.2.1 *chopped strand, n*—cut staple polymer fiber of specified lengths.

3.2.2 *fiber, n—as used for concrete reinforcement*, chopped strand that is mixed into concrete or mortar.

3.2.2.1 *Discussion—*

Fiber used for concrete or mortar reinforcement is available in various deniers. These include:
(a) Macro polyolefin fiber which has linear density greater than or equal to 580 denier (equivalent diameter ≥ 0.3 mm).

(b) Micro polyolefin fiber which has a linear density of less than 580 denier (equivalent diameter < 0.3 mm).

(c) Hybrid fiber which include a combination of macro polyolefin and micro polyolefin fibers.

(d) Multi-length fibers which consist of chopped strands of various lengths of fiber.

(e) Graded fiber which consists of a gradation of multiple length and multiple denier fibers.

3.2.3 *fiber reinforced concrete (FRC), n*—hydraulic cement concrete that includes chopped strands (fibers).

3.2.4 *finish content, n*—the percent by mass of finish extractions on the fiber.

3.2.5 *high-tenacity fiber, n*—a manufactured fiber that belongs to a generic class of fibers having exceptional breaking strength; or having a breaking strength significantly greater than the average strength of other (regular tenacity) fibers in the same generic class of equivalent linear densities.

3.2.6 *polyolefin, n*—any long-chain synthetic polymer composed of at least 85 % by weight of ethylene, propylene, or other olefin units (monomers), except amorphous (noncrystalline) polyolefin.

3.2.7 *reprocessed materials, n*—materials that have been recycled from another process.

3.2.8 *strand, n*—a single fiber, filament, or monofilament.

3.2.9 *skein, n*—a continuous strand of yarn, wound on a hand or motorized reel.

3.2.10 *yarn, n*—*as used for fiber concrete reinforcement*, narrow slit extruded film.

SPECIFICATIONS

4. Chopped Strands for FRC

4.1 Polyolefin chopped strands shall be manufactured and tested to specific targets and tolerances as detailed in the manufacture's product specifications.

4.2 Materials shall be tested during processing (skeins or uncut strands) and after processing (chopped strands).

5. Summary

5.1 Summaries of the various testing procedures are included in the referenced test methods, or in pertinent sections of this specification.

5.1.1 *Denier:* D1577 Test Method for Linear Density of Textile Fibers

D1907 Linear Density of Yarn by Skein Method

5.1.2 *Tensile:* D2256 Test Method for Tensile Properties of Yarns by the Single-Strand Method

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5.1.3 *Tenacity*—The tensile stress expressed force per unit linear density of the unstrained specimen. (Sometimes expressed in grams per denier, or GPD.)

D2256 Test Method for Tensile Properties of Yarns by the Single-Strand Method

5.1.4 *Elongation:* D2256 Test Method for Tensile Properties of Yarns by the Single-Strand Method

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5.1.5 *Initial Modulus:* D2256 Test Method for Tensile Properties of Yarns by the Single-Strand Method

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5.1.6 *Equivalent Diameter*—The diameter of a circle having the same cross-sectional area as the fiber or strand. The measurement may be derived from stated calculation provided in Eq 1.

5.1.7 *Finish Content*—Based on percent of total mass. Several methods of finish extractions are recognized including the use of a NMR system (Nuclear Magnetic Residence), Rapid Oil Extraction Apparatus, and spin finish analysis based on Test Method D2257. None of these systems or this standard addresses the chemical properties or types of chemicals that may be contained in the finish applied. Certain chemicals at various dosages may cause change in the properties of concrete mix performance such as air gain.

5.1.8 *Fiber Length*—Total distance from the outer ends of the finished fiber or developed length.

5.1.9 *Alkali Resistance*—Test Method for Determining Alkaline Resistance of Fibers, Annex B of ICC ES AC32.

6. Significance and Use

6.1 *Acceptance Testing*—The test methods in Specification D2256 and D3218 for the determination of the properties of polyolefin cut strands are considered satisfactory for acceptance testing of commercial shipments of polyolefin cut strands for use in concrete.

6.2 *Laboratory Correlation Testing*—If there are differences of practical significance between reported test results for two laboratories (or more) a comparative test should be performed to determine if there is a statistical bias between them, using competent statistical assistance. As a minimum, use test samples that are as homogeneous as possible, drawn from the material from which the disparate test results were obtained, and randomly assigned in equal numbers to each laboratory for testing. The test results from the two laboratories should be compared using a statistical test for unpaired data, at a probability level chosen