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## Standard Guide for Selecting Materials to Be Used for Insulation, Jacketing, and Strength Components in Fiber-Optic Cables<sup>1</sup>

This standard is issued under the fixed designation D4967; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. ~~Scope~~ Scope\*

1.1 This guide is intended to provide a list of materials commonly used in components that provide insulation, jacketing and strength in fiber-optic cables. Where these materials are covered by ASTM standards, an appropriate reference is made. Due to changing technology, not all materials being used are necessarily listed here.

1.2 This guide does not include materials used in components for optical purposes (optical fiber and its coating) or external metallic armoring (such as for a barrier to rodents).

1.3 This guide offers two general lists of materials:

1.3.1 A subdivision of fiber-optic cable construction into components that are used for insulation, jacketing, or strength, with a generic material classification for specific applications in each component (see Section 5~~);~~, and

1.3.2 An alphabetical list of the generic material classifications, showing ASTM standards where they exist (see [Table 1](#)).

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:*<sup>2</sup>

[D1248](#) Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable

[D1457](#) Specification for Polytetrafluoroethylene (PTFE) Molding and Extrusion Materials (Withdrawn 1996)<sup>3</sup>

[D1711](#) Terminology Relating to Electrical Insulation

[D2116](#) Specification for FEP Resin Molding and Extrusion Materials

[D2287](#) Classification System and Basis for Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds

[D2526](#) Specification for Ozone-Resisting Silicone Rubber Insulation for Wire and Cable (Withdrawn 2006)<sup>3</sup>

[D3159](#) Specification for Modified ETFE Fluoropolymer Molding and Extrusion Materials

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee [D09](#) on Electrical and Electronic Insulating Materials and is the direct responsibility of Subcommittee [D09.07](#) on Electrical Insulating Materials.

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<sup>2</sup> 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.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](#).

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

**TABLE 1 Materials in Current Use**

Material	ASTM Specification
Acrylates	...
Aramids:	
fibers	<a href="#">D3317</a>
tape	...
Fluoroplastics:	
ECTFE	<a href="#">D3275</a>
ETFE	<a href="#">D3159</a>
FEP	<a href="#">D2116</a>
PFA	<a href="#">D3307</a>
PTFE	<a href="#">D1457</a>
PVDF	<a href="#">D3222</a>
PVDF copolymers	<a href="#">D5575</a>
Low-density poly(vinylidene fluoride)	<a href="#">D8318</a>
Glass fibers	...
Glass-fiber reinforced plastics	...
Grease and similar materials	<a href="#">D4730</a> , <a href="#">D4731</a> , <a href="#">D4732</a>
Nylon	<a href="#">D4066</a>
Polybutylene	<a href="#">D4730</a> , <a href="#">D4731</a> , <a href="#">D4732</a>
Polycarbonate	<a href="#">D3935</a>
Polyester tape	<a href="#">D3664</a>
Polyethylene	<a href="#">D1248</a>
Polyimide tape	...
Polypropylene	<a href="#">D4101</a>
Polyurethane	...
Poly(vinyl chloride)	<a href="#">D2287</a>
Rubber	<a href="#">D4730</a> , <a href="#">D4731</a> , <a href="#">D4732</a>
Silicone rubber	<a href="#">D2526</a>
Steel	...
Thermoplastic elastomer	<a href="#">D4246</a>
Thermoplastic polyester	<a href="#">D4507</a>

  
<https://standards.iteh.ai>

- [D3222](#) Specification for Unmodified Poly(Vinylidene Fluoride) (PVDF) Molding Extrusion and Coating Materials
- [D3275](#) Classification System for E-CTFE-Fluoroplastic Molding, Extrusion, and Coating Materials
- [D3307](#) Specification for Perfluoroalkoxy (PFA) Resin Molding and Extrusion Materials
- [D3317](#) Specification for High Modulus, Organix Yarn and Roving (Withdrawn 1985)<sup>3</sup>
- [D3664](#) Specification for Biaxially Oriented Polymeric Resin Film for Capacitors in Electrical Equipment
- [D3935](#) Classification System and Basis for Specification for Polycarbonate (PC) Unfilled and Reinforced Material
- [D4066](#) Classification System for Nylon Injection and Extrusion Materials (PA)
- [D4101](#) Classification System and Basis for Specification for Polypropylene Injection and Extrusion Materials
- [D4246](#) Specification for Ozone-Resistant Thermoplastic Elastomer Insulation for Wire and Cable, 90 °C Operation
- [D4507](#) Specification for Thermoplastic Polyester (TPES) Materials (Withdrawn 1999)<sup>3</sup>
- [D4730](#) Specification for Flooding Compounds for Telecommunications Wire and Cable
- [D4731](#) Specification for Hot-Application Filling Compounds for Telecommunications Wire and Cable
- [D4732](#) Specification for Cool-Application Filling Compounds for Telecommunications Wire and Cable
- [D5575](#) Classification System for Copolymers of Vinylidene Fluoride (VDF) with Other Fluorinated Monomers
- [D8318](#) Specification for Low-Density Poly (Vinylidene Fluoride) Based Material Intended for Use in Wire and Cable Jacketing

### 3. Terminology

3.1 *Definitions*—For definitions of terms used in this guide, refer to Terminology [D1711](#).

#### 3.1 *Definitions:*

3.1.1 For definitions of terms used in this guide, refer to Terminology [D1711](#).

#### 3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *buffer, n*—a material that is applied over an optical fiber’s protective coating to further protect the fiber from physical damage and provide mechanical protection.

3.2.2 *composite buffer, n*—polymeric material(s) surrounding the optical fiber so that the inner layer is in intimate contact with the fiber cladding or coating with a tightly extruded buffer material overall.

3.2.3 *loose tube(s), n*—a buffer material that surrounds the optical fiber(s) so that it forms a tube or channel whose inside dimension is greater than the fiber’s outside diameter (or combined diameters).

3.2.3.1 *Discussion*—

When required, the space between the fiber(s) and the inside of the tube may be filled with a suitable filling compound or with strength or cushioning elements, or both.

3.2.4 *slotted core, n*—an element(s) with helical grooves assembled around a central strength member, in which optical fibers, optical fiber ribbons or copper conductors can be placed.

3.2.5 *strength member(s), n*—material(s) used in fiber optic cable construction which provide mechanical integrity and stability.

3.2.6 *tight buffer, n*—a material surrounding the optical fiber so that it is in intimate contact with the coating on the fiber.

#### **4. Significance and Use**

4.1 The lists of components and materials are useful in enhancing the user’s understanding of the technology and construction of fiber-optics cables and the development of performance standards for cables.

4.2 This guide is intended for use by all parties involved with fiber optics: materials suppliers, cable manufacturers, and end-users.

#### **5. Construction Terminology and Material Selection Options**

5.1 Fiber-optic cable components and materials that have been used for each:

5.1.1 *Buffers/Tubes:*

5.1.1.1 *Tight Buffers:*

- (a) Fluoroplastic.
- (b) Nylon.
- (c) Thermoplastic Polyester.
- (d) Poly(vinyl chloride).

5.1.1.2 *Loose Tubes:*

- (a) Fluoroplastic.
- (b) Nylon.
- (c) Thermoplastic Polyester.
- (d) Polycarbonate.
- (e) Polyethylene.

5.1.1.3 *Composite Buffers*—Silicone rubber.

5.1.1.4 *Slotted Cores:*

- (a) Polyethylene.
- (b) Polypropylene.

5.1.1.5 *Pipes*—Polyethylene.

5.1.1.6 *Sheaths:*

- (a) Fluoroplastic.
- (b) Nylon.
- (c) Silicone rubber.
- (d) Thermoplastic elastomer.
- (e) Polyethylene.

5.1.1.7 *Ribbons:*

- (a) Acrylates.