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**STANDARD FOR OPTICAL FIBER**

**OUTSIDE PLANT COMMUNICATIONS CABLE**

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IHS  
15 Inverness Way East  
Englewood, CO 80113-5776 USA  
Telephone: (800) 854-7179  
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## FOREWORD

(This Foreword is not part of this Standard.)

This Standard provides information on specifying optical fiber cables for outdoor use in telecommunications applications.

The first edition of this Standard was approved by ICEA on March 4, 1992, and the second revision on September 15, 1999. A third revision was approved by ICEA on June 8, 2005. It was published by ICEA, but was not published as an ANSI-approved Standard. Revision 4 of this Standard, approved by ICEA on September 13, 2006, was a republication of revision 3. It was approved by The American National Standards Institute (ANSI) on December 8, 2006 and adopted by the Telecommunications Industry Association (TIA) as TIA-472D000-B in April 2007. The fifth revision was approved by ICEA on June 7, 2011 and by ANSI on January 17, 2012. The members of the ICEA Communications Cable Division Working Group who participated in the sixth edition of this standard were:

Jim Ryan, Chairman and Editor

G. Dorna	R. Gould	N. Hatch
M. D. Kinard	J Lichtenwalner	J. Mohler
D. Parke	M. Rainville	J. Register
T. Schmalzigaug	R. Stanko	R. Stevens
D. Taylor	T. West	H. Toland
P. VanVickle		

This issue replaces the previous issue of ANSI/ICEA S-87-640-2011, *Standard for Optical Fiber Outside Plant Communications Cable*. Major changes in this revision include the following:

- Addition of new fiber types
- Added 200  $\mu\text{m}$  fiber coating option
- Redefined hybrid and composite cable
- Added additional ribbon types
- No fiber splices allowed in cable
- Clarified the residual fiber strain for greater than 100 to 200 kpsi fiber is a maximum of 17 % or proof test load
- Figure 8 galloping test now references IEC 60794-1-21 Method E26 standard
- Added jacket fungus resistance test.

This Standard contains eight annexes. Annexes C, D, and F are normative and are considered part of this Standard. Annex E is normative and considered part of this Standard when required by the customer. Annexes A, B, G, and H are informative and are not considered part of this Standard.

ICEA Standards are adopted in the public interest and are designed to eliminate misunderstanding between the manufacturer and user and to assist the user in selecting and obtaining proper products for a particular need. The existence of an ICEA Standard does not in any respect preclude the manufacture or use of products not conforming to this Standard.

The user of this Standard is cautioned to observe any applicable health or safety regulations and rules relative to the manufacture and use of cable made in conformity with this Standard. This Standard hereafter assumes that only properly trained personnel using suitable equipment will manufacture, test, install, and/or perform maintenance on cables defined by this Standard.

Requests for interpretation of this ICEA Standard must be submitted in writing (hard copy or email) to the Secretary of the Insulated Cable Engineers Association. The mailing address of ICEA Headquarters and a *Contact* link are shown on the ICEA web site - [www.icea.net](http://www.icea.net). An official written interpretation will be provided.

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# CONTENTS

<u>SECTION</u>		<u>PAGE</u>
<b>PART 1</b>	<b>INTRODUCTION</b>	<b>1</b>
1.1	Scope.....	1
1.2	General .....	3
1.3	Units.....	4
1.4	Definitions .....	4
1.5	References .....	5
1.6	Information to be Supplied by the User .....	5
1.7	Modification of this Standard .....	6
1.8	Quality Assurance.....	6
1.9	Safety Considerations .....	6
<b>PART 2</b>	<b>OPTICAL FIBERS</b>	<b>8</b>
2.1	General .....	8
2.2	Optical Fiber Classes.....	8
2.3	Optical Fiber Requirements.....	8
2.4	Optical Fiber Coating and Requirements .....	8
<b>PART 3</b>	<b>OPTICAL FIBER CORE UNITS</b>	<b>11</b>
3.1	General .....	11
3.2	Loose Buffer Tubes .....	11
3.3	Optical Fiber Bundles .....	12
3.4	Optical Fiber Ribbons .....	12
3.5	Tight Buffers .....	13
<b>PART 4</b>	<b>CABLE AND COMPONENT ASSEMBLY AND IDENTIFICATION</b>	<b>15</b>
4.1	Cabling of Multi-Fiber and Composite Optical Cables .....	15
4.2	Identification of Fibers within a Unit.....	15
4.3	Identification of Units within a Cable.....	15
4.4	Identification of Conductors in Hybrid Cable .....	15
4.5	Strength Members .....	17

## CONTENTS (cont.)

<b><u>SECTION</u></b>		<b><u>PAGE</u></b>
<b>Part 4:</b>	<b>(Continued)</b>	
4.6	Assembly of Cables .....	17
4.7	Filling and Flooding Material .....	17
<b>PART 5</b>	<b>COVERINGS</b>	<b>19</b>
5.1	Binders .....	19
5.2	Core Wrap .....	19
5.3	Shielding, Armoring, or Other Metallic Coverings .....	19
5.4	Jackets .....	21
5.5	Jacket Repairs .....	25
5.6	Other Coverings .....	26
5.7	RipCORDS .....	26
<b>PART 6</b>	<b>OTHER REQUIREMENTS</b>	<b>27</b>
6.1	Identification and Date Markings .....	27
6.2	Optical Cable Identification and Other Markings .....	28
6.3	Length Marking .....	28
6.4	Cable Remarking .....	29
6.5	Packaging, Packing, and Package Marking .....	29
<b>PART 7</b>	<b>TESTING, TEST METHODS, AND REQUIREMENTS</b>	<b>31</b>
7.1	Testing .....	31
7.2	Extent of Testing .....	31
7.3	Standard Test Conditions .....	31
7.4	Electrical Testing of Conductive Materials .....	32
7.5	Construction, Color Code, and Identification .....	32
7.6	Jacket Thickness Measurements .....	33
7.7	Jacket Material Density Measurement .....	33
7.8	Jacket Tensile Strength, Yield Strength, and Ultimate Elongation Tests .....	33
7.9	Jacket Material Absorption Coefficient Test .....	34

## CONTENTS (cont.)

<u>SECTION</u>	<u>PAGE</u>
<b>Part 7: (Continued)</b>	
7.10 Environmental Stress Crack Resistance Test.....	34
7.11 Jacket Shrinkage Test.....	35
7.12 Verification of Cable Length and Marking Accuracy .....	36
7.13 Cable and Component Dimensions .....	36
7.14 Ribbon Dimensions .....	37
7.15 Ribbon Twist Test.....	38
7.16 Ribbon Residual Twist Test.....	38
7.17 Ribbon Separability Test .....	39
7.18 Ripcord Functional Test.....	40
7.19 Material Compatibility and Cable Aging Test .....	40
7.20 Tight Buffer Strippability Test .....	42
7.21 Cable Low and High Temperature Bend Test.....	42
7.22 Cable External Freezing Test .....	43
7.23 Compound Flow (Drip) Test for Filled Cable .....	43
7.24 Cable Temperature Cycling Test.....	44
7.25 Hydrogen Evolution in Cable .....	44
7.26 Cable Sheath Adherence Test .....	45
7.27 Cyclic Flexing Test.....	45
7.28 Water Penetration Test .....	46
7.29 Cable Impact Test .....	47
7.30 Cable Tensile Loading and Fiber Strain Test.....	47
7.31 Cable Compression Loading Test .....	49
7.32 Cable Twist Test .....	50
7.33 Cable Lightning Damage Susceptibility Test.....	50
7.34 Mid-Span Buffer Tube Storage.....	51
7.35 Central Tube Cable Coupling .....	52
7.36 Oxidative Induction Time, OIT .....	52
7.37 Buffer Tube Kink Test.....	53
7.38 Jacket Fungus Resistance .....	54

## CONTENTS (cont.)

<u>SECTION</u>		<u>PAGE</u>
<b>PART 8</b>	<b>FINISHED CABLE OPTICAL PERFORMANCE REQUIREMENTS</b>	<b>55</b>
8.1	Optical Performance.....	55
8.2	Attenuation Coefficient .....	56
8.3	Multimode Optical Bandwidth.....	57
8.4	Optical Point Discontinuities .....	57
8.5	Cable Cutoff Wavelength (Single-Mode Fibers Only) .....	58
8.6	Polarization Mode Dispersion (Single-Mode Fibers Only).....	58
<b>PART 9</b>	<b>REFERENCES</b>	<b>60</b>
 <b><u>ANNEXES</u></b>		
<b>Annex A</b> (Informative)	Suggested Information for a Purchase Document .....	66
<b>Annex B</b> (Informative)	Metallic Covering Materials .....	68
<b>Annex C</b> (Normative)	Requirements for Very-Low Temperature Applications....	73
<b>Annex D</b> (Normative)	Self-supporting Figure-8 Cables Designs.....	75
<b>Annex E</b> (Normative)	1625 nm Cabled Fiber Performance Requirements.....	79
<b>Annex F</b> (Normative)	All-Dielectric Self-Supporting Cable (ADSS) .....	80
<b>Annex G</b> (Informative)	General Outside Plant Optical Fiber Cable Installation Considerations .....	81
<b>Annex H</b> (Informative)	ICEA Telecommunications Cable Standards.....	86
 <b><u>FIGURES</u></b>		
Figure 7.1	Ribbon dimensional parameters.....	37
Figure 7.2	Ribbon preparation .....	39
Figure 7.3	Ribbon separation.....	39

## CONTENTS (cont.)

<b><u>TABLES</u></b>		<b><u>PAGE</u></b>
Table 1.1	Cable normal temperature ranges.....	2
Table 2.1	Multimode optical fiber specification requirements .....	9
Table 2.2	Single-mode optical fiber specification requirements.....	10
Table 2.3	Fiber bend characteristics of G.657 single-mode fiber.....	10
Table 4.1	Individual fiber, unit, and group identification .....	16
Table 5.1	Requirements for jackets removed from completed cable.....	24
Table 5.2	Jacket thickness requirements .....	25
Table 6.1	Year of manufacture marker threads.....	28
Table 7.1	Sample preparation and test set-up, jacket tensile properties .....	34
Table 7.2	Maximum dimensions of optical fiber ribbons .....	37
Table 8.1	Attenuation coefficient performance requirements .....	55
Table 8.2	Multimode bandwidth coefficient performance requirements.....	55
Table 8.3	Point discontinuity acceptance criteria .....	56
Table 8.4	Optical attenuation measurement methods .....	56
Table 8.5	Multimode optical bandwidth measurement methods.....	57
Table B.1	Thickness of aluminum alloy tapes .....	68
Table B.2	Thickness of copper, copper alloy, and bronze tapes.....	69
Table B.3	Thickness of copper-steel-copper laminate tapes.....	69
Table B.4	Stainless steel tape composition .....	70
Table B.5	Stainless steel tape physical performance .....	71
Table B.6	Thickness of stainless steel tapes.....	71
Table B.7	Thickness of steel tapes .....	71
Table B.8	Steel tape composition .....	72
Table D.1	Outer jacket thickness requirements for figure-8 messenger cables .....	76
Table D.2	Dimension requirements for messenger webs.....	76
Table E.1	Acceptance criteria for L-Band operation .....	79

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## PART 1

### INTRODUCTION

#### 1.1 Scope

##### 1.1.1 Products

This Standard covers optical fiber communications cable intended for outdoor use and normally installed aerially, directly buried, or placed in underground ducts. Additional requirements are included in Annex D for “figure-8” aerial self-supporting cables and in Annex F for all-dielectric self-support cables, as appropriate. Materials, constructions, and performance requirements are included in the Standard, together with applicable test procedures. Refer to other published ICEA cable product standards for information on optical fiber cable requirements for other applications:

- S-83-596: Indoor optical fiber cable
- S-104-696: Indoor-outdoor optical fiber cable)
- S-110-717: Standard for optical fiber drop cable
- S-112-718: Optical fiber cable for placement in sewer environments)
- S-115-730: Optical fiber cables intended for Multiple Dwelling Unit (MDU) applications
- S-119-741: Fiber to the antenna (FTTA) optical fiber cable.
- S-120-742: Hybrid optical fiber cables intended for use in limited power circuits.
- S-121-744: Optical fiber outside plant microduct cables.

##### 1.1.2 Applications Space

Products covered by this Standard are intended for operation only under conditions normally found in communications systems. These products normally convey communications signals (voice, video, and data) from point-to-point or point-to-multi-point, external to buildings. Products covered by this Standard may be factory terminated with connectors or splicing modules.

When a hybrid cable is required, the applicable metallic conductor requirements shall be as established by agreement between the end user and the cable manufacturer. The requirements of ANSI/ICEA S-84-608 should be considered when determining appropriate requirements.

### 1.1.3 Temperature Ranges

The normal temperature ranges for cables covered by this Standard are given in Table 1.1

For the purposes of this standard, very-low temperature applications are defined as  $-50\text{ }^{\circ}\text{C}$  ( $-58\text{ }^{\circ}\text{F}$ ) per 1.4.1.6 and are addressed in Annex C), which contains requirements for lower operating and storage temperatures than listed in Table 1.1.

**Table 1.1 - Cable normal temperature ranges**

	$^{\circ}\text{C}$	$(^{\circ}\text{F})$
Operation	-40 to +70	(-40 to +158)
Storage and Shipping	-40 to +70	(-40 to +158)
Installation	-30 to +60	(-22 to +140)

### 1.1.4 Tensile Rating

The standard installation tensile rating for cables covered by this Standard is 2670 N (600 lbf). Higher tensile ratings are also acceptable. For applications where a lower tensile rating is appropriate, the standard lower tensile rating is 1330 N (300 lbf). In all cases, the residual load is defined as a load equal to 30 % of the installation tensile rating.

For self-supporting aerial applications there are additional considerations that need to be addressed to ensure that the cable design is appropriate for the self-supporting distance and environmental loading conditions. See 7.30 and Annex D for information on figure-8 self-supporting aerial cable requirements and considerations. Also, see Annex F for information on all-dielectric self-supporting cable requirements and considerations.

For aerial applications in which the optical cable is lashed to a separate messenger wire, the use of a cable designed for a standard tensile rating for installation by direct burial, trenching, or pulling into duct may be adequate.

### 1.1.5 Minimum Bend Diameter

The standard minimum bend diameters for cables covered by this Standard are:

Residual (Installed): 20 x Cable OD or 30 x Cable OD  
for ribbon cables greater than or equal to 216 fibers

Loaded Condition (During Installation): 40 x Cable OD

For very small cables (e.g., such as those installed in microducts), manufacturers may specify a fixed cable minimum bend diameter (e.g., 300 mm) that is independent of the cable outer diameter (OD).

For cables not having a circular cross-section, bend diameter requirements are to be determined using the thickness (minor axis) as the cable diameter and bending in the direction of the preferential bend.

## 1.2 GENERAL

This Standard is so arranged that cables may be selected from numerous constructions covering a broad range of installation and service conditions. Parts 2 to 5 cover the major components and assembly of the cables:

Parts 2 and 3 designate the materials, material characteristics, dimensions, and tests applicable to the particular component.

Part 4 covers assembly, cabling, and identification of the individual optical fibers and conductors.

Part 5 describes coverings, such as binders, wraps, metallic coverings, and jacketing of the optical cable.

Part 6 provides other pertinent requirements not otherwise addressed by Parts 1 through 5 or by Part 7 of this Standard.

Part 7 contains the test methods and requirements applicable to completed cables and component parts. If there is a conflict between Parts 1 through 6 and Part 7, the provisions of Part 7 apply.

Part 8 contains routinely specified optical performance, requirements, and test methods for finished cables.

Part 9 contains cross-references to other standards and publications.

Annex A (Informative) contains information for users on ordering the types of cable products covered by this Standard.

Annex B (Informative) contains information on metallic shield and tape materials used in some outside plant cable constructions.

Annex C (Normative) contains information and requirements for cables used in "very low temperature" applications (-50 °C).

Annex D (Normative) contains additional information and requirements on aerial self-supporting figure-8 cable designs with integrated metallic messenger wire.

Annex E (Normative) contains requirements for 1625 nm performance requirements for outside plant cables when required by the customer.

Annex F (Normative) contains requirements for all-dielectric self support requirements.

Annex G (Informative) contains general considerations for installation of outside plant cable.

Annex H (Informative) contains information on other ICEA Standards.

### 1.3 Units

In this Standard, metric (SI) units are used. Their approximate U.S. customary units are included where appropriate. Where approximate equivalents in alternate systems are included, they are provided for information only and in most cases are rounded off for measurement convenience. Unless otherwise specified, the Rounding Method of ASTM E 29 shall be used. ICEA P-57-653 is a useful guide for metric units used in this publication.

### 1.4 Definitions

For the purposes of this Standard, the following definitions apply.

#### 1.4.1 Cable Classifications

##### 1.4.1.1 Composite Cables<sup>1</sup>

Cables containing more than one type of optical fiber.

##### 1.4.1.2 Dielectric Cables

Cables which contain no metallic members or other electrically conductive materials.

##### 1.4.1.3 Figure-8 Cables

A specific type of aerial self-supporting cable design in which the outermost jacket is co-extruded over the cable core and an integral messenger wire, with the core and messenger separated by a thin webbing of the jacket material. The resulting characteristic “figure-8” shape gives these cables their name.

##### 1.4.1.4 Hybrid Cables<sup>1</sup>

Cables having both optical fibers and metallic conductors that are intended for communications use or powering.

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<sup>1</sup> ICEA Standards prior to 2012 use definitions for *composite* and *hybrid* which are the exact opposite of those shown here. The change in definitions was made in the interest of harmonization with International documents and other National Standards. It must be noted that the definition of *composite* in the National Electrical Code, 2011 and earlier, are consistent with the older ICEA definition. Due to this change, users may see the terms used interchangeably. Regarding the definition for *hybrid*, as altered above: IEC uses a definition which encompasses metallic conductors used for all purposes – not just communication.

#### 1.4.1.5 Metallic Cables

Cables that contain conductive members including those not normally intended to transmit information (voice, video, or data), such as metallic strength members, sheaths, shields, or armors. This also includes elements intended for toning/locating.

#### 1.4.1.6 Very Low Temperature Cables

Cables designed, specified, and qualified for use in applications where the low-end temperature extremes may reach -50 °C. Refer to Annex C which contains information and requirements for cables specified for use in very low temperature applications.

#### 1.4.2 Jackets and Sheaths

In this Standard, the term "jacket" refers to a continuous non-metallic covering while "sheath" refers to the protective elements covering the cable core, which may include a combination of metallic coverings, jackets, strength members, and the like.

#### 1.4.3 Optical Fiber and Electric/Electronic Terms

Refer to TIA-440 and IEEE-812 for definitions of other optical fiber terms. Refer to ANSI/IEEE 100 for definitions of other electrical and electronic terms.

#### 1.4.4 Detail Specification

The term "Detail Specification" shall be used to refer to any requirement or set of requirements that are specific to the user's purchase. In case of conflict between a requirement called out in a Detail Specification and this Standard, the requirements of this Standard may be modified by agreement between the manufacturer and user.

### 1.5 References

All documents referenced herein are listed in Part 9.

### 1.6 Information To Be Supplied by The User

When requesting proposals from cable manufacturers, the prospective user should describe the cable by referencing the pertinent paragraphs of this Standard. To help avoid misunderstandings and possible misapplication of cable, the user should also provide pertinent information concerning the intended application. Recommended ordering information is summarized in Annex A.