

**STANDARD FOR
OPTICAL FIBER
OUTSIDE PLANT COMMUNICATIONS CABLE**

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FOREWORD

(This Foreword is not part of this Standard.)

This Standard provides information on specifying fiber optic 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. This revision to the Standard was approved by ICEA on September 13, 2006. This Standard was approved by The American National Standards Institute (ANSI) on December 8, 2006. This Standard will be presented to the Telecommunications Industry Association (TIA) with the intent that it be adopted as TIA-472D000-A. The members of the ICEA Communications Cable Division Working Group who participated in this project were:

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This issue replaces the previous issue of ANSI/ICEA S-87-640-1999, *Standard for Optical Fiber Outside Plant Communications Cable*. Major changes in this revision include the following:

- Cables with alternate tensile ratings for various applications
- Addition of Tight Buffer cables for outdoor use
- Addition of very low temperature cable performance requirements (Annex C)
- Figure-8 self-supporting cable (Annex D)
- 1625 nm performance requirements (Annex E)

This Standard contains six annexes. Annexes C and D 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, and F 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.

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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.

Questions of interpretation of ICEA Standards can only be accepted in writing and the reply shall be provided in writing. Suggestions for improvements in this Standard are welcome. Questions and suggestions shall be sent to:

Secretary
Insulated Cable Engineers Association, Inc.
Post Office Box 1568
Carrollton, GA 30112
United States of America

In Memory

of his more than forty years of contributions to the Wire & Cable Industry; in particular, for his fifteen years of leadership in the ICEA Communications Cable Section. During this time he was instrumental in the preparation of three major Standards this being one of them. This latest revision is hereby dedicated to the memory of:

H. Marvin McNeil
April 23, 1927 – October 18, 1998

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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 for “figure-8” aerial self-supporting cables are included in Annex D, as appropriate. Materials, constructions, and performance requirements are included in the Standard, together with applicable test procedures. Refer to other published ICEA (ANSI/TIA) cable product standards for information on fiber optic cable requirements for other applications:

- S-83-596: Optical fiber premises distribution cable (ANSI/TIA-472C000-B)
- S-104-696: Indoor-outdoor optical fiber drop cable (ANSI/TIA-472E000)
- S-110-717: Optical fiber drop cable (ANSI/TIA-472F000)

1.1.2 Applications Space

Products covered by this Standard are intended only for operation 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 composite 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 °C (-58 °F) per 1.4.1.6, and are addressed in Annex C (Normative), which contains requirements for lower operating and storage temperatures than listed in Table 1.1.

Table 1.1 - Cable normal temperature ranges

	°C	(°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 use. 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 any load less than or equal to 30 percent 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.

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 O.D.
Loaded Condition (During Installation):	40 x Cable O.D.

For very small cables, such as those installed in miniature ducts, 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 (Informative) contains information on other ICEA Standards.

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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

Cables containing both optical fibers and metallic conductors that are intended for communications use.

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

Cables which contain more than one type of optical fiber.

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 or powering.

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 (Normative) 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 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. This definition does not apply to the optical fiber Detail Specifications referenced in Table 2.1 and Table 2.2 of this Standard.

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.

1.7 MODIFICATION OF THIS STANDARD

Any part of this Standard may be modified by agreement between the manufacturer and user, but such modifications shall be clearly denoted as exceptions to the Standard. In this Standard, requirements which are recognized to have various options, but for which preferred values are given, have been introduced by phrases such as, "Unless otherwise specified," "as mutually agreed upon," or "Unless otherwise modified by manufacturer and user." Requirements which must be determined in each case are introduced by phrases such as, "...as agreed upon between manufacturer and user," or "...as mutually agreed upon."

1.8 QUALITY ASSURANCE

It is the responsibility of the manufacturer to establish a quality assurance system consistent with ANSI/ASQC Q9000, ISO 9001, TL 9000[®], or an alternate system acceptable to the user, which will assure conformance with the requirements of this Standard. When the user wishes to require a specific quality assurance program or special testing procedures, agreement between the user and the manufacturer should be reached before the order is placed.

1.9 SAFETY CONSIDERATIONS

Materials in the cable shall present no dermal or environmental hazards as defined by current industry Standards, or by applicable federal or state laws, codes, and regulations. The manufacturer and user of cables made in accordance with this Standard are cautioned to observe any applicable health or safety rules and regulations relative to their manufacture and use. This Standard hereafter assumes that the manufacture, testing, installation, and maintenance of the fiber optic cables defined herein will be performed only by properly trained personnel, using suitable equipment, employing appropriate safety precautions, and working in accordance with applicable local, state, and national safety requirements.