



**STANDARD FOR HYBRID OPTICAL FIBER
AND POWER CABLE FOR USE IN LIMITED
POWER CIRCUITS**

ANSI/ICEA S-120-742-2016

©2016 by

INSULATED CABLE ENGINEERS ASSOCIATION, Inc.

This page has been left intentionally blank

STANDARD FOR
HYBRID OPTICAL FIBER AND POWER CABLE FOR USE IN LIMITED
POWER CIRCUITS

Publication S-120-742

First Edition – May 19th , 2016

Published By
Insulated Cable Engineers Association, Inc.
Post Office Box 1568
Carrollton, Ga 30112, USA
(770) 830-0369

Approved December 2nd, 2015 by
INSULATED CABLE ENGINEERS ASSOCIATION, Inc.

Approved ,May 19th ,2016 by ANSI ASC C-8
AMERICAN NATIONAL STANDARDS INSTITUTE

Copyrighted by the ICEA
Contents may not be reproduced
in any form without permission of the

INSULATED CABLE ENGINEERS ASSOCIATION, INC.

Copies of this publication may be obtained from:

IHS
15 Inverness Way East
Englewood, Co 80113-5776, USA

Telephone: (800) 854-7179

www.ihs.com

NOTICE AND DISCLAIMER

The information in this publication was considered technically sound by the consensus of persons engaged in the development and approval of the document at the time it was developed. Consensus does not necessarily mean that there is unanimous agreement among every person participating in the development of this document.

The Insulated Cable Engineers Association, Inc. (ICEA) standards and guideline publications, of which the document contained herein is one, are developed through a voluntary consensus standards development process. This process brings together persons who have an interest in the topic covered by this publication. While ICEA administers the process and establishes rules to promote fairness in the development of consensus, it does not independently test, evaluate, or verify the accuracy or completeness of any information or the soundness of any judgments contained in its standards and guideline publications.

ICEA disclaims liability for personal injury, property, or other damages of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, application, or reliance on this document. ICEA disclaims and makes no guaranty or warranty, expressed or implied, as to the accuracy or completeness of any information published herein, and disclaims and makes no warranty that the information in this document will fulfill any of your particular purposes or needs. ICEA does not undertake to guarantee the performance of any individual manufacturer or seller's products or services by virtue of this standard or guide.

In publishing and making this document available, ICEA is not undertaking to render professional or other services for or on behalf of any person or entity, nor is ICEA undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances. Information and other standards on the topic covered by this publication may be available from other sources, which the user may wish to consult for additional views or information not covered by this publication.

ICEA has no power, nor does it undertake to police or enforce compliance with the contents of this document. ICEA does not certify, test, or inspect products, designs, or installations for safety or health purposes. Any certification or other statement of compliance with any health or safety-related information in this document shall not be attributable to ICEA and is solely the responsibility of the certifier or maker of the statement.

This page has been left blank intentionally.

FOREWORD

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 his particular need. Existence of an ICEA Standard does not in any respect preclude the manufacture or use of products not conforming to the 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 perform manufacture, testing, installation and maintenance of 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, U.S.A
United States of America

Alternatively, you can contact ICEA by utilizing the Contact link in the ICEA web site:

www.icea.net

The members of the ICEA Communications Cable Section, Working Group 742, who participated in this project, were:

Jim Register, Chairman

G. Dorna
J. Mohler
D. Taylor

R. Gould
J. Ryan
P. VanVickle

M. D. Kinard
J. Shinoski
T. West

TABLE of CONTENTS

<u>SECTION</u>	<u>PAGE</u>
Part 1: INTRODUCTION	1
1.1 Scope	1
1.2 General	2
1.3 Units	3
1.4 Definitions	3
1.5 References	6
1.6 Information to be Supplied by the User	6
1.7 Modification of this Standard	6
1.8 Quality Assurance	6
1.9 Fire Resistance Code Requirements	6
1.10 Electrical Power Code Requirements	7
1.11 Safety Considerations	7
Part 2: OPTICAL FIBERS	8
2.1 General	8
Part 3: OPTICAL FIBER CORE UNITS	9
3.1 General	9
Part 4: CABLE ASSEMBLY, FILLERS, STRENGTH MEMBERS, FIBER AND UNIT IDENTIFICATION	10
4.1 Cabling of Multi-Fiber Optical Cables	10
4.2 Identification of Fibers within a Unit	10
4.3 Identification of Units within a Cable	10
4.4 Strength Members	10
4.5 Assembly of Cables	10
4.6 Filling and Flooding Material	11
Part 5: COVERINGS	12
5.1 General	12
Part 6: MARKING AND PACKAGING	13
6.1 General	13
Part 7: TESTING AND TEST METHODS	14
7.1 Testing	14
7.2 Extent of Testing	14
7.3 Standard Test Conditions	14
7.4 Electrical Testing	14
7.5 Reference Test Documents	15

<u>SECTION</u>		<u>PAGE</u>
Part 8:	FINISHED CABLE OPTICAL PERFORMANCE REQUIREMENTS	17
	8.1 General	17
Part 9:	REFERENCES	18

TABLES

Table 1-1	Temperature Ranges.....	2
Table 4-1	Identification of Copper Conductors	11
Table 7-1	Standard Test Conditions	14
Table 7-2	Test Requirements by Cable Type.....	15

ANNEXES

ANNEX A	Ordering Information (Informative).....	A-1
ANNEX B	1625 nm Single- mode Cabled Fiber Performance Requirements (Normative)....	B-1
ANNEX C	ICEA Telecommunication Cable Standards (Informative).....	C-1
ANNEX D	Maximum Tension on Cable Conductors.....	D-1

This page has been left blank intentionally.

PART 1

INTRODUCTION

1.1 SCOPE

This Standard covers performance requirements for limited power hybrid copper and fiber communications cables intended for use in the buildings, or for short distances external to the building of communications users. The optical fiber is intended for communications use while the copper conductors are intended for limited power applications in accordance with Articles 725 and 800 of the National Electric Code (NEC) ANSI/NFPA 70. Typically, these cables utilize conductor sizes that range from 10 AWG to 20 AWG. Generally these cables are limited to a maximum of 100 VA. However, refer to NEC document for detailed requirements. Materials, constructions and performance requirements are included in the Standard, together with applicable test procedures.

Products covered by this standard are intended only for operation under conditions normally found in communication systems. Typically, these products are installed both in exposed areas (surface mounted to walls or building baseboards or in non-stationary configurations) and in concealed areas (within walls, attics, etc.), with or without external protection (such as conduit), depending upon product type and specific use. These products normally convey communications signals (voice, video, data, etc.) from place to place within a building. Products covered by this Standard may be factory terminated with connectors or splicing modules.

This standard is intended to serve as a reference to the most recent appropriate standards; ICEA S-83-596 for optical fiber communications cables intended for indoor use, ICEA S-104-696 for optical fiber communications cables intended for indoor-outdoor use and UL13 for Power Limited Circuit Cables with the addition of any additional requirements to ensure a functional cable design.

This standard is written from the application perspective of an Distributed Antenna System (DAS), however, other use cases that involve hybrid fiber/copper in a Limited Power application as defined by the National Electric Code, are considered to apply.

The normal temperature ranges for cables covered by this Standard are listed in Table 1-1:

Table 1-1
Temperature Ranges

	Riser and General Purpose		Plenum	
	°C	°F	°C	°F
<u>Indoor</u>				
Operation	-20 to +70	-4 to 158	0 to +70	32 to 158
Storage and Shipping	-40 to +70	-40 to 158	-40 to +70	-40 to 158
Installation	-10 to 60	14 to 140	0 to 60	32 to 140
<u>Indoor-Outdoor</u>				
Operation	-40 to +70	-40 to 158	-40 to +70	-40 to 158
Storage and Shipping	-40 to +70	-40 to 158	-40 to +70	-40 to 158
Installation	-10 to 60	14 to 140	0 to 60	32 to 140

The standard installation tensile rating for cables is specified in Table 7-2.

<u>Standard Minimum Bend Diameter</u>	<u>Interconnect</u>	<u>All Other Cables</u>
Unloaded Condition (Installed):	50 mm	20 x Cable OD
Loaded Condition (During Installation):	100 mm	40 x Cable OD

For very small cables, 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.

Products covered by this Standard shall comply with the pertinent Fire Resistance Code(s) described in Section 1.9.

1.2 GENERAL

This publication is arranged so that cables may be selected from numerous constructions covering a broad range of installation and service conditions.

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 fiber.

Part 5 includes cable coverings.

Part 6 provides other pertinent requirements not otherwise addressed by Parts 1 through 5 or by Parts 7 and 8 of this Standard.