



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

**TECHNICAL REQUIREMENTS**

Approved by

**AMERICAN NATIONAL STANDARDS INSTITUTE**

June 7, 2000

**Publication # ANSI/ICEA S-87-640-1999**  
(Revised 1999)

Copyright © 1999 by

**INSULATED CABLE ENGINEERS ASSOCIATION, Inc.**

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

September 1999

Published By  
**INSULATED CABLE ENGINEERS ASSOCIATION, Inc.**  
Post Office Box 440  
South Yarmouth, Massachusetts 02664, U.S.A.

Approved September 15, 1999 by  
INSULATED CABLE ENGINEERS ASSOCIATION, Inc.

Approved June 7, 2000 by  
AMERICAN NATIONAL STANDARDS INSTITUTE

© 1999 by  
**INSULATED CABLE ENGINEERS ASSOCIATION, INC.**

Contents may not be reproduced in any form without permission of the Insulated Cable Engineers Association, Inc. All rights including translation into other languages, reserved under the Universal Copyright Convention, the Berne Convention or the Protection of Literary and Artistic Works, and the International and Pan American Copyright Conventions.

**INSULATED CABLE ENGINEERS ASSOCIATION, Inc.**  
P.O. Box 440  
South Yarmouth, Massachusetts  
02664 USA

## FOREWORD

ICEA publications 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 their particular need. Existence of an ICEA Standard does not in any respect preclude the manufacture or use of products not conforming to the publication.

The Secretary can only accept questions of interpretation of ICEA publications in writing at Headquarters, and the reply shall be provided in writing.

Suggestions for improvements in this publication are welcome, and should be sent to ICEA at the address on the preceding page.

The first edition of this Standard was approved by ICEA on March 4, 1992. This revision to the original Standard was approved by ICEA on September 15, 1999. The members of the ICEA Communications Cable (COM) Section Working Group 640 who developed this publication were:

J. Douglas Coleman, Chairman

M. D. Ashby  
J. K. Crews  
T. G. Hardin  
F. Marquez  
M. Silva

N. J. Baer  
O. Daneshvar  
M. D. Kinard  
D. O. Osornio  
J. C. Smith  
J. H. Walling

D. K. Baker  
G. L. Dora  
R. Lovie  
W.T. Posey  
J. S. Tyler

The following participated in an advisory capacity to WG 640:

D. L. Abernethy-Shook  
R. Lindsay

G. Davidson  
J. R. Sach  
S. Stokes

W. H. Ficke  
N. W. Sollenberger

## **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

# CONTENTS

<u>SECTION</u>	<u>PAGE</u>
<b>Part 1: INTRODUCTION</b>	
1.1 Scope .....	1
1.2 General .....	2
1.3 Units .....	2
1.4 Definitions .....	2
1.5 References .....	3
1.6 Information to be Supplied by the User .....	3
1.7 Modification of this Standard .....	3
1.8 Quality Assurance .....	4
1.9 Safety Considerations .....	4
<b>Part 2: OPTICAL FIBERS</b>	
2.1 General .....	5
2.2 Optical Fiber Classes .....	5
2.3 Optical Fiber Requirements .....	5
2.4 Optical Fiber Coating and Requirements .....	5
<b>Part 3: OPTICAL FIBER CORE UNITS</b>	
3.1 General .....	8
3.2 Buffer Tubes .....	8
3.3 Optical Fiber Bundles .....	8
3.4 Optical Fiber Ribbons .....	9
<b>Part 4: CABLE ASSEMBLY, FILLERS, STRENGTH MEMBERS, FIBER, UNIT, AND CONDUCTOR IDENTIFICATION</b>	
4.1 Cabling of Multi-Fiber and Composite Optical Cables .....	11
4.2 Identification of Fibers in Optical Fiber Cable .....	11
4.3 Identification of Cable Core Units .....	13
4.4 Identification of Conductors in Composite Cable .....	13
4.5 Strength Members .....	13
4.6 Assembly of Cables .....	13
4.7 Filling and Flooding Material .....	13
4.8 Verification of Construction .....	14
<b>Part 5: COVERINGS</b>	
5.1 Binders .....	15
5.2 Core Wrap .....	15
5.3 Shielding, Armoring, or Other Metallic Coverings .....	15
5.4 Jackets .....	17
5.5 Jacket Repairs .....	21
5.6 Other Coverings .....	21
5.7 Ripcords .....	21

# CONTENTS

## SECTION

## PAGE

### **Part 6: OTHER REQUIREMENTS**

6.1	Identification and Date Marking .....	22
6.2	Optical Cable Identification and Other Markings .....	23
6.3	Length Marking .....	23
6.4	Packaging, Packing, and Package Marking .....	24

### **Part 7: TESTING, TEST METHODS, AND REQUIREMENTS**

7.1	Testing .....	26
7.2	Extent of Testing .....	26
7.3	Standard Test Conditions .....	26
7.4	Electrical Testing .....	26
7.5	Jacket Thickness Measurement .....	27
7.6	Jacket Eccentricity Measurement .....	27
7.7	Jacket Material Density Measurement .....	27
7.8	Jacket Tensile Strength, Yield Strength, and Ultimate Elongation Tests .....	27
7.9	Jacket Material Absorption Coefficient Test .....	28
7.10	Environmental Stress Crack Resistance Test .....	28
7.11	Jacket Shrinkage Test .....	29
7.12	Verification of Cable Length and Marking Accuracy .....	29
7.13	Optical Fiber and Buffer Tube Dimensions .....	30
7.14	Ribbon Dimensions .....	30
7.15	Compatibility Testing .....	31
7.16	Ribbon Twist Test .....	32
7.17	Ribbon Residual Twist Test .....	32
7.18	Ribbon Separability Test .....	33
7.19	Low and High Temperature Bend Test .....	34
7.20	Cable External Freezing Test .....	34
7.21	Compound Flow (Drip) Test for Filled Cable .....	35
7.22	Cable Temperature Cycling Test .....	35
7.23	Hydrogen Evolution in Cable .....	36
7.24	Cable Sheath Adherence Test .....	36
7.25	Cyclic Flexing Test .....	37
7.26	Water Penetration Test .....	37
7.27	Impact Test .....	37
7.28	Optical Fiber Cable Tensile Loading and Fiber Strain Test .....	38
7.29	Compressive Loading Test .....	39
7.30	Cable Twist Test .....	40
7.31	Cable Cutoff Wavelength Measurement (Single-mode Fibers Only) .....	40
7.32	Polarization Mode Dispersion (PMD) (Single-mode Fibers Only) .....	41
7.33	Lightning Damage Susceptibility Test .....	41