

STANDARD FOR
OPTICAL FIBER CABLE
FOR PLACEMENT IN SEWER ENVIRONMENTS

Publication S-112-718

Second Edition – November 2013

Published By
Insulated Cable Engineers Association, Inc. (ICEA)
P. O. Box 1568
Carrollton, Georgia 30112, USA

Approved June 2013 by
INSULATED CABLE ENGINEERS ASSOCIATION, Inc.

Approved November 8, 2013, by
The American National Standards Institute

FOREWORD

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

The first edition of this Standard was approved by ICEA on June 12, 2007, and was approved by The American National Standards Institute (ANSI) on April 8, 2008. That edition was adopted by the Telecommunications Industry Association (TIA) as TIA-472G000, in April 2010. This second edition was approved by ICEA on June 4, 2013, and approved by ANSI on November 8, 2013.

The members of the ICEA Communications Cable Division, Working Group 718 who participated in this project were:

	Mike Kinard, Chairman	
G. Dorna	J. Register	D. Taylor
R. Gould	J. Shinoski	P. VanVickle
J. Ryan		

This issue replaces the previous issue, ANSI/ICEA S-112-718-2008/TIA-472G0000, *Standard for Optical Fiber Cable for Placement in Sewer Environments*. Major changes in this revision include the following:

- Addition of new fiber types and reformatting of the fiber out-references
- New, altered definitions of composite and hybrid cables
- Addition of definitions for ribbons
- Addition of a buffer tube kink test
- Addition of an Expanded Ambient Test Condition and designation of those tests which utilize it
- Addition of a Normative Annex on 1625 nm performance

NOTE – The format of the Tables of this issue of the document has been modified from the previous issue and generally follows that of IEC Directives Part 2.

This Standard contains four annexes. Annex C is normative and considered part of this Standard when required by the customer. Annexes A, B, and D 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

Purchase Now

ANSI/ICEA S-112-718-2013

using suitable equipment will manufacture, test, install and/or perform maintenance on cables defined by this Standard.

The Secretary can only accept questions of interpretation of ICEA Standards in writing at Headquarters at the address below, 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, ICEA can be contacted by utilizing the *Contact* link in the ICEA web site:

www.icea.net

CONTENTS

<u>PARAGRAPH</u>	<u>PAGE</u>
Part 1: INTRODUCTION	1
1.1 Scope	1
1.2 General	4
1.3 Units	5
1.4 Definitions	5
1.5 References.....	7
1.6 Information to Be Supplied by the User	7
1.7 Modification of this Standard	7
1.8 Quality Assurance.....	7
1.9 Fire Resistance Codes	8
1.10 Safety Considerations.....	8
Part 2: OPTICAL FIBERS	10
2.1 General	10
2.2 Optical Fiber Classes.....	10
2.3 Optical Fiber Requirements	10
2.4 Optical Fiber Coating and Requirements	10
Part 3: OPTICAL FIBER CORE UNITS	13
3.1 General	13
3.2 Buffered Fiber	13
3.3 Loose Buffer Tubes	14
3.4 Optical Fiber Bundles	15
3.5 Optical Fiber Ribbons	15
3.6 Slotted Core	16
Part 4: CABLE ASSEMBLY, FILLERS, STRENGTH MEMBERS, AND FIBER AND UNIT IDENTIFICATION	17
4.1 Cabling of Multi-Fiber Optical Fiber Cables.....	17
4.2 Identification of Fibers within a Unit.....	17
4.3 Identification of Units within a Cable.....	17
4.4 Identification of Conductors in Hybrid Cable	17
4.5 Strength Members	19
4.6 Assembly of Cables	19
4.7 Filling and Flooding Materials	19

Purchase Now

ANSI/ICEA S-112-718-2013

<u>PARAGRAPH</u>	<u>PAGE</u>
Part 5: COVERINGS	21
5.1 Binders.....	21
5.2 Shielding, Armoring, or Other Metallic Coverings	21
5.3 Jackets.....	23
5.4 Other Coverings.....	24
5.5 Jacket Repairs	24
5.6 Ripcords.....	25
Part 6: OTHER REQUIREMENTS	26
6.1 Identification and Date Marking	26
6.2 Optical Cable Identification and Other Markings	26
6.3 Length Marking	26
6.4 Cable Remarking	27
6.5 Packaging and Marking	27
Part 7: TESTING AND TEST METHODS	29
7.1 Testing	29
7.2 Extent of Testing	29
7.3 Standard Test Conditions	29
7.4 Electrical Testing of Conductive Cable Components	30
7.5 Verification of Physical Construction, Color Code, and Identification	30
7.6 Environmental Stress Cracking Resistance Test	31
7.7 Jacket Shrinkage Test	32
7.8 Cable Chemical Resistance Test	32
7.9 Gas-Blocked Cable Test.....	35
7.10 Weathering Test	35
7.11 Verification of Cable Length and Marking Accuracy.....	36
7.12 Dimensions of Fibers, Buffered Fibers, and Buffer Tubes	36
7.13 Ribbon Dimensions.....	37
7.14 Ribbon Separability Test.....	38
7.15 Ribbon Twist Test	39
7.16 Ribbon Residual Twist Test.....	40
7.17 Buffer Strippability Test.....	40
7.18 Ripcord Functional Test.....	41
7.19 Material Compatibility and Cable Aging Test	42
7.20 Cable Low and High Temperature Bend Test.....	43
7.21 Cable External Freezing Test	44
7.22 Cable Compound Flow (Drip) Test.....	44
7.23 Cable Temperature Cycling Test.....	45

<u>PARAGRAPH</u>	<u>PAGE</u>
Part 7: TESTING AND TEST METHODS (continued)	
7.24 Cable Cyclic Flexing Test	45
7.25 Cable Impact Test.....	46
7.26 Cable Cold Impact Test	46
7.27 Cable Tensile Loading, Bending, and Fiber Strain Test.....	47
7.28 Cable Compressive Loading Test	49
7.29 Cable Twist Test	50
7.30 Cable Sheath Adherence Test	50
7.31 Cable Water Penetration Test	51
7.32 Cable Fire Resistance	51
7.33 Jacket Tensile Strength, Yield Strength, and Ultimate Elongation Testing.	52
7.34 Oxidative Induction Time, OIT	52
7.35 Jacket Thickness Measurements	52
7.36 Buffer Tube Kink Test	53
Part 8: FINISHED CABLE OPTICAL PERFORMANCE REQUIREMENTS	54
8.1 Optical Performance	54
8.2 Attenuation Coefficient.....	55
8.3 Multimode Optical Bandwidth	56
8.4 Measurement of Optical Point Discontinuities	57
8.5 Cable Cutoff Wavelength Measurement (Single-Mode Fibers)	57
PART 9 REFERENCES	59
ANNEX A ORDERING INFORMATION	63
ANNEX B SEWER CABLE CONSIDERATIONS	64
ANNEX C 1625 NM SINGLE-MODE CABLED FIBER PERFORMANCE REQUIREMENTS	75
ANNEX D ICEA TELECOMMUNICATIONS CABLE STANDARDS	76

TABLES

Table 1-1 Cable Normal Temperature Ranges	2
Table 2-1 Multimode Fiber Specifications.....	11
Table 2-2 Single-mode Fiber Specifications	12
Table 4-1 Individual Fiber, Unit, and Group Identification	18
Table 7-1 Fluid Immersion Test Criteria	33

Purchase Now

ANSI/ICEA S-112-718-2013

Table 7-2	Maximum Dimensions of Optical Fiber Ribbons	38
Table 8-1	Attenuation Coefficient Requirements.....	54
Table 8-2	Multimode Bandwidth Coefficient Performance Requirements.....	55
Table 8-3	Point Discontinuity Acceptance Criteria	55
Table 8-4	Optical Attenuation Measurement Methods	56
Table 8-5	Multimode Optical Bandwidth Measurement Methods.....	57

FIGURES

Figure 7-1	Ribbon Dimensional Parameters.....	37
Figure 7-2	Ribbon Preparation.....	38
Figure 7-3	Ribbon Separation.....	39

ICEA STANDARD FOR OPTICAL FIBER CABLE FOR PLACEMENT IN SEWER ENVIRONMENTS

PART 1

INTRODUCTION

1.1 Scope

1.1.1 General Overview

This Standard covers optical fiber communications cables intended for installation in underground sewers, specifically storm and sanitary sewers. Materials, construction, and performance requirements are included in this Standard, together with applicable test procedures. Additional applications-based considerations are discussed as well.

Refer to other ICEA optical cable product Standards which may have relevance to cables of this Standard:

- ICEA S-87-640 for optical fiber communications cables intended for general outside plant use
- ICEA S-104-696 for optical fiber communications cables intended for indoor/outdoor use.
- ICEA S-110-717 for optical fiber cables intended for aerial, duct, and buried outdoor and indoor/outdoor drop applications
- ICEA S-115-730 for optical fiber cables intended for Multiple Dwelling Unit (MDU) applications

Note that the MDU application space may overlap that of drop cables.

Refer to the following published ICEA optical cable product Standard for other applications

- ICEA S-83-596 for optical fiber cables intended for indoor applications.

1.1.2 Applications Space

Products covered by this Standard are intended for use in metropolitan, urban, and suburban communications networks via use of underground infrastructures, in the last portion of all-optical networks, such as storm and sanitary sewers. These products convey communications signals (voice, video, and data) in metropolitan network rings and serve as point-to-point connections to the subscriber's premises via sewer laterals, in the last portion of the optical network.

When a hybrid cable (a cable with both optical fibers and metallic conductors) is required, the applicable metallic conductor requirements shall be as established