

[Purchase Now](#)

ANSI/ICEA S-105-692

**STANDARD FOR 600 VOLT
SINGLE LAYER THERMOSET INSULATED
UTILITY UNDERGROUND
DISTRIBUTION CABLES**

[Purchase Now](#)

Purchase Now

Approved as an American National Standard
ANSI Approval Date: 9/29/2011

ANSI/ICEA Publication S-105-692-2010

*Standard For 600 Volt Single Layer Thermoset Insulated
Utility Underground Distribution Cables*

Developed and Published by

Insulated Cable Engineers Association, Inc.

Post Office Box 1568
Carrollton, GA 30112, USA

© Copyright 2010 by the Insulated Cable Engineers Association, Incorporated. All rights including translation into other languages, reserved under the Universal Copyright Convention, the Berne Convention for the Protection of Literary and Artistic Works, and the International and Pan American Copyright Conventions

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 judgements 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 judgement 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.

Contents

		Page
	Foreword	iii
Section 1	General	
1.1	Scope	1
1.2	Constructions	1
1.3	Design Options	1
	1.3.1 Conductors	1
	1.3.2 Insulation	1
	1.3.3 Neutral	1
	1.3.4 Assembly	1
1.4	Operating Conditions	2
	1.4.1 Normal Service Temperature	2
	1.4.2 Emergency Overload Temperature	2
	1.4.3 Short Circuit Temperature	2
	1.4.4 Rated Voltage	2
1.5	Qualification	3
1.6	Testing	3
1.7	Test Methods	3
1.8	Standards and Specifications	3
Section 2	Conductor	
2.0	General	4
2.1	Physical and Electrical Properties	4
	2.1.1 Copper Conductors	4
	2.1.2 Aluminum Conductors	4
2.2	Conductor Size Units	5
2.3	Conductor Diameter	5
2.4	Conductor dc Resistance per Unit Length	5
	2.4.1 Direct Measurement of dc Resistance per Unit Length	5
	2.4.2 Calculation of dc Resistance per Unit Length	6
Section3	Insulation	
3.1	Insulation	13
3.2	Thickness Requirements	13
3.3	Separator	13
3.4	Electrical Requirements	13
	3.4.1 Insulation Resistance	13
	3.4.2 Voltage Test	14
	3.4.2.1 Single Conductors	14
	3.4.2.2 Twisted Assemblies	14
3.5	Physical Requirements	14
Section 4	Assemblies and Identification	
4.1	Assemblies	16
4.2	Identification	16
	4.2.1 Conductor Marking	16
	4.2.2 Insulated Neutral Identification	16

Purchase Now

ICEA S-105-692-2011

Page ii

		Page
Section 5	Test Methods	
5.1	Test Temperatures	17
5.2	Methods of Measuring Insulation Physical Air Oven Aging Properties	17
5.3	Method of Measuring Insulation Hot Creep	17
Section 6	Qualification Tests	
6.1	Suitability of Insulation for Use on AC Circuits in Wet Locations	18
	6.1.1 Qualification	18
	6.1.2 Insulation Resistance Stability	18
	6.1.2.1 Minimum Insulation Resistance at Rated Temperature	18
	6.1.2.2 Maximum Rate of Decrease	19
6.2	Accelerated Electrical Requirements in Water	19
6.3	Sunlight Resistance of Insulation's of Colors Other Than Black	19
	6.3.1 Qualification	20
	6.3.2 Sunlight Resistance	20
	6.3.2.1 Carbon-Arc Weather-O-Meter	20
	6.3.2.2 Xenon-Arc Weather-O-Meter	20
6.4	Crush Test for Direct Burial Applications	21
	6.4.1 Qualification	21
APPENDICES		
A	English/Metric Conversion	22
B	Titles and dates of Industry Standards Referenced in This Document	23
C	Recommended Bending Radii for Insulated Conductors and Cable Assemblies	25
	C.1 Scope	25
	C.2 Minimum Bending Radii	25
D	Minimum Drum Diameters of Reels for Single Conductors and Assemblies	25
LIST OF TABLES		
2-1	Schedule for Establishing Maximum Direct Current Resistance per Unit Length Of Completed Cable Conductors Listed in Table 2-2	6
2-2	Nominal Direct Current Resistance in Ohms per 1000 ft. at 25 °C of Solid and Stranded Conductor	7
2-2 (Metric)	Nominal Direct Current Resistance in Ohms per Kilometer at 25 °C of Solid and Stranded Conductor	8
2-3	Nominal Diameters for Aluminum and Copper Conductors	9
2-3 (Metric)	Nominal Diameters for Aluminum and Copper Conductors	10
2-4	Factors for Determining Nominal Resistance of Stranded Conductors	11
2-5	Weight Increment Factors	12
3-1	Conductor Sizes, Insulation Thickness, and Test Voltages	14
3-2	Insulation Physical Properties	15
6-1	Accelerated Electrical Requirements	20

Foreword

This standard publication for 600 Volt Single Layer Thermoset Insulated Utility Underground Distribution Cables, *ICEA S-105-692* was developed by the Insulated Cable Engineers Association, Inc. (ICEA)

ICEA standards and guides are adopted in the public interest and are designed to eliminate misunderstanding between the manufacturer and the user and to assist the user in selecting and obtaining the proper product for his particular need. Existence of an ICEA standard or guide does not in any respect preclude the manufacture or use of products not conforming to the standard or guide. The user of this standard is cautioned to observe any health or safety regulations and rules relative to the manufacture and use of the cable made in conformity with this standard.

Request for interpretation of this standard must be submitted in writing to the Insulated Cable Engineers Association, Inc. Box 1568, Carrollton, Georgia 30112. An official written interpretation will be provided. Suggestions for improvements gained in the use of this standard will be welcomed by the Association.

©

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

INSULATED CABLE ENGINEERS ASSOCIATION, Inc.
Post Office Box 1568
Carrollton, Georgia 30112 USA
Telephone: (770) 830-0369

Purchase Now

ICEA S-105-692-2011

Page iv

< This page intentionally left blank. >

Section 1 GENERAL

1.1 SCOPE

This standard applies to the materials, constructions, and testing of single conductor cables and assemblies of completed single conductor thermoset insulated cables, with an insulated or bare copper or an insulated aluminum neutral, used for the distribution of electrical energy at phase-to-phase voltages not exceeding 600 volts, or phase-to-ground voltage not exceeding 480 volts, 60 Hz, and at conductor temperatures not exceeding 90 °C for use in direct burial and underground ducts.

1.2 CONSTRUCTIONS

Single conductor cables and assemblies of single conductor cables shall use conductors not smaller than 8 AWG and not larger than 1000 kcmil. The conductors of a duplex assembly shall be of the same size. When allowed, the neutral in an assembly of three cables for use in single-phase 3-wire circuits, or the neutral in an assembly of four cables, may be reduced but shall not be less than 50% of the cross-sectional area of one phase conductor. The neutral shall be insulated if the conductor is aluminum and may be bare or insulated if the conductor is copper.

1.3 DESIGN OPTIONS

The user of this standard should recognize that it covers many options. The user should select the necessary options required for a complete description of the desired cable.

1.3.1 Conductors

Metal - Aluminum 1350, AA-8000 Series alloy, or copper.
Size - 8 AWG to 1000 kcmil, aluminum or copper.

Conductor Stranding - See Section 2.

1.3.2 Insulation

90 °C Rated - See Section 3

1.3.3 Neutral

Insulated aluminum, bare copper, insulated copper – See Section 2

1.3.4 Assembly

See Section 4.1 - Twisted or parallel - Two or more insulated conductors without an overall covering

Purchase Now

ICEA S-105-692-2011

Page 6