Society of Cable Telecommunications Engineers

ENGINEERING COMMITTEE
Interface Practices Subcommittee

AMERICAN NATIONAL STANDARD

ANSI/SCTE 100 2010

Specification for 75 Ω Smooth Aluminum Subscriber Access Cable

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1.0 SCOPE

1.1 This specification applies to the material, electrical and mechanical properties of seventy-five ohm smooth aluminum outer conductor coaxial cables as defined herein.

1.2 Seventy-five ohm smooth aluminum outer conductor coaxial cables are used to distribute radio frequency (R.F.) signals and power for voice, data, and video applications as applicable.

2.0 CENTER CONDUCTOR

2.1 Material

2.1.1 The center conductor shall be copper clad aluminum (CCA) or copper clad steel (CCS). The outer layer of copper shall be metallurgically bonded and continually cover the core prior to processing, the composite conductor shall meet the requirements of ASTM B 566- Class 10A or 10H, ASTM B 869.

2.1.2 Solid copper center conductor may also be available, if required by the user. Low DC resistance is the main advantage to using solid copper. The copper conductor shall meet the requirements of ASTM B1 and/or ASTM B3.

2.2 Joints

Factory joints in the finished product shall be allowed. The ultimate tensile strength in the joint area when tested per ASTM E-8 shall be 90% of the original unspliced wire.

2.3 Dimensions

2.3.1 Center conductor dimensions shall be 0.0708 inches (1.80 mm).

2.3.2 All center conductor tolerances shall be ± 1%.

2.4 Mechanical

2.4.1 Minimum break strength (MBS) of the copper clad aluminum (CCA) or copper clad steel (CCS) conductor shall be determined by multiplying the minimum cross sectional area by 20,000 psi (138 MPa) for CCA, and 115,000 psi (793 MPa) for CCS.

2.5 Electrical

2.5.1 The center conductor electrical conductivity for CCA shall be 62.5 percent IACS minimum. The center conductor electrical conductivity for CCS shall be 18 percent IACS minimum.

2.5.2 Maximum DC Resistance shall be measured per SCTE 44 2005, and shall meet the requirements of Table 2.0.

Table 2.0, Maximum DC Resistance at 68°F (20°C), Ohms/kft (Ohms/km)

Product Type	Inner Conductor	Outer Conductor	Loop
320-F CCA	3.28 (10.76)	1.06 (3.48)	4.27 (14.01)
320-F CCS	9.63 (31.6)	1.06 (3.48)	10.69 (35.07)

3.0 DIELECTRIC

3.1 Dielectric material extruded over the center conductor shall be an insulating grade virgin polyethylene and shall not contain reground, reprocessed or recycled materials. The insulation shall consist of foamed polyethylene with a closed cell structure. It shall be applied concentrically and bonded to the center conductor. The dielectric shall also contain a stabilization package to meet the requirements of section 9.5 Thermal Oxidative Stability (TOS).

3.2 Unless otherwise specified, polyethylene materials for the dielectric shall meet all applicable requirements of ASTM D 1248 and requirements of this document.

3.3 Nominal Dielectric Diameter - 0.294 inches (7.47 mm)

4.0 OUTER CONDUCTOR (SHIELD)

4.1 Material

The outer conductor will consist of a continuous extruded or welded tube of aluminum. It shall be made from an aluminum alloy of the 1XXX series as described in ANSI H35.1. The alloy used by the manufacturer must produce a finished product that meets all the electrical and mechanical properties specified elsewhere in this document.

4.2 Outer Conductor Dimensions

The inside diameter, outside diameter and thickness of the outer conductor shall meet the requirements of Table 4.0.

Table 4.0, Outer Conductor Dimensions Inch (mm)

Product Type	Diameter * Over Outer Conductor	Nominal Inside Diameter of Outer Conductor	Nominal Thickness of Outer Conductor
320-F	0.320 (8.13)	0.294 (7.47)	0.013 (0.34)

Note: * = Tolerance on diameter over outer conductor is ± 0.002 in. (± 0.05 mm).

4.3 Dielectric Adhesion to Outer Conductor

A polymer adhesive coating may be used to bond the dielectric to the outer conductor. The adhesive coating shall be compatible with all cable components in contact and shall not degrade either the electrical or mechanical properties of the product.

5.0 OUTER CONDUCTOR FLOODING COMPOUND

5.1 Material

5.1.1 Cables intended for below grade use shall have a flooding compound applied over the outer conductor to block moisture ingress and help prevent corrosion. The finished product shall meet requirements of ANSI/SCTE 69 2007 for corrosion resistance.

5.1.2 Cables intended for aerial or indoor applications, which contain a corrosion protection material, shall meet the non-flowing requirement as described in ANSI/SCTE 11 2006.

6.0 CABLE JACKET

6.1 Material

The outer jacket shall be polyethylene (PE). The jacket shall be free of pinholes, cracks and blisters. PE jacket shall contain carbon black to ensure ultraviolet light stability (UV).

6.1.1 The jacket material shall be UV stable, as defined in UL 1581, paragraph 1200*, Reference Standard for Electric Wire, Cables and Flexible Cords.*

6.1.2 Cables for indoor, aerial or below grade applications may contain corrosion protection materials applied between the cable jacket and cable outer conductor as shall meet the requirements of section 5.0.

6.2 Mechanical

6.2.1 The diameter over jacket (DOJ) shall be measured as described in ANSI/SCTE 33 2001: Test Method for Diameter of Drop Cable.

6.3 Diameter Over Jacket (DOJ)

The DOJ of the various types of cables shall meet the requirements of Table 6.1.

Table 6.1, Nominal Diameter Over Jacket, Inch (mm)

Product Type	Non Flooded	Flooded	Armor
320-F	0.395 (10.03)	0.395 (10.03)	0.550 (13.97)

6.4 Jacket Thickness

6.4.1 The minimum thickness at any point of the overall jacket shall meet the requirements of Table 6.2.

Table 6.2, Minimum Jacket Thickness, Inch (mm)

Product Type	Aerial	Underground	Armor
320-F	0.025 (0.64)	0.022 (0.56)	0.022 (.56)

6.5 Jacket Eccentricity

6.5.1 The average thickness at any cross section shall be determined from four readings, including the minimum thickness taken approximately 90° apart.

6.5.2 The eccentricity of the jacket shall not exceed 43 percent and shall be calculated as follows:

$$\left(\frac{\text{Max\_thickness} - \text{Min\_thickness}}{\text{Avg\_thickness}}\right)\cdot 100$$

6.5.3 The maximum thickness at any cross section shall not be greater than 155 percent of the minimum jacket thickness.

7.0 INTEGRAL MESSENGER

7.1 Material

An integral messenger (support) joined to the coaxial cable by an overall extruded PE jacket shall be galvanized steel. The steel wire shall meet requirements of ASTM A 641, Class 1, Hard Temper. The diameter of the wire is dependent upon the application and shall be agreed upon by the user. Table 7.0 lists the most commonly used sizes.

Table 7.0 Messenger Diameters	
0.083 ± 0.003	2.11 ± 0.05
0.109 ± 0.003	2.77 ± 0.05

7.2 Factory joints in the messenger shall not be allowed in a shipping length of cable.

7.3 It is recommended that a slitter/planner tool be used for separating the messenger and preparing the coax for connector acceptance.

8.0 ARMOR

8.1 Material

8.1.1 Armor may be applied to protect the finished product from mechanical and rodent damage. The armor shall be any of the following materials:

1. A steel tape 0.006 in. (0.15 mm) thick.

2. A copper clad stainless steel tape 0.006 in. (0.15 mm) thick per ASTM B 694.

3. A steel tape with an adhesive coating on one side and a corrosion protection plating on the other side, the tape thickness with plating or adhesives shall be 0.008 in. (0.20 mm).

8.2 Armor Construction

The armor tape shall be corrugated and longitudinally applied. If an adhesive coated tape is used the armor should bond at the overlap.

8.3 Outer Jacket

An outer jacket shall be extruded over the armor and meet requirements of section 6.0.

9.0 FINISHED PRODUCT TESTS

9.1 Mechanical

9.1.1 PE Jacket Longitudinal Shrinkage

There shall be no more than 0.375 in. (9.53 mm) shrinkage along a six-inch length of finished product. The test shall comply with ANSI/SCTE 88 2007.

9.1.2 Dielectric Shrinkback

Dielectric shrinkback on the conductor shall be no more than 0.250 inch (6.35 mm) from both ends. All change in length from the time the specimens are cut shall be included. Samples shall be placed in an air circulating oven for four hours at 239°F ± 2F° (115°C ± 1C°). Test shall be according to ASTM D 4565.

9.1.3 Dielectric Shear Adhesion

The force that is required to strip the dielectric from the center conductor in the finished product as specified in ANSI/SCTE 12 2006 shall be 20lbf (89N) minimum.

9.1.4 Air Leakage Test

The foam dielectric shall pass the flow of 5 psi of air pressure for a minimum of 15 seconds on a 12-inch sample when tested in accordance with ANSI/SCTE 13 2006.

9.1.5 Thermal Oxidative Stability

To ensure the desired life expectancy of the dielectric insulation, determine its Oxidative Induction Time (OIT) before and after aging by the following test method. Insulation shall be tested by measuring OIT according to ASTM D 4565, Section 17. The test utilizes insulation removed from the completed cable. Requirements for OIT – Initial: 20 minutes minimum, after aging: 70 percent of initial value.

9.1.6 Cable Static Minimum Bend

The minimum bend radius shall be determined in accordance with ANSI/SCTE 39 2007.

9.2 ELECTRICAL

9.2.1 Characteristic Impedance

The impedance shall be 75 ± 3ohms. The measurement method shall be performed according to SCTE/ANSI 66 2008 or equivalent.

9.2.2 Conductor Resistance

The DC resistance of the inner and outer conductor shall be measured per SCTE 44 2005. The maximum resistance values shall comply with Table 2.0.

9.2.3 Velocity of Propagation (Vp)

The Vp shall be 82 percent minimum when measured per ANSI/SCTE 49 2007.

9.2.4 Structural Return Loss (SRL)

Minimum Structural Return Loss shall be -20 dB in the frequency range 5 – 1002 MHz. per ANSI/SCTE 03 2007.

9.2.5 The cable minimum ampacity shall be determined per ANSI/SCTE 32 2009 and shall be 24 amperes at 68°F (20°C) ambient temperature, assuming current in both conductors.

9.2.6 The overall cable jacket integrity when tested in accordance with ANSI/SCTE 63 2009 shall pass a spark test with a minimum 2.5 kV rms to ensure the absence of faults in the jacket during manufacturing.

9.2.7 The dielectric between inner conductor and outer conductor of the cable shall withstand without breakdown, for one minute, a voltage of 1000V RMS at a frequency of 60 Hz, or the equivalent DC voltage at 1 milliamp/100 ft. leakage detection when tested at 68º F (20 º C) per SCTE 108 2006

9.2.8 Attenuation

The attenuation shall be measured per SCTE 47 2007 or equivalent and the maximum values shall meet the requirements of Table 10.1.

Table 10.1, 320-F Maximum Attenuation at 68°F (20°C), dB/100 ft. (dB/100m)

Frequency MHz.	**dB/100 ft**	**(dB/100m)**	**Frequency MHz.**	**dB/100 ft**	**(dB/100m)**
5	.024	.079	**400**	2.38	7.81
55	0.84	2.76	**450**	2.52	8.27
211	1.73	5.68	**500**	2.72	8.92
250	1.86	6.10	**550**	2.85	9.35
270	1.94	6.37	**600**	2.98	9.78
300	2.04	6.69	**750**	3.34	10.96
325	2.17	7.12	**865**	3.62	11.87
350	2.25	7.38	**1000**	3.89	12.76

10.0 NORMATIVE REFERENCES

The following documents contain provisions that, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent edition of the documents listed below.

1. ANSI H35.1 American Aluminum Association Alloy and temper Designation Systems or Aluminum 1XXX

2. ANSI/SCTE 03 2008: Test Method for Coaxial Cable Structural Return Loss

3. ANSI/SCTE 11 2006: Test Method for Aerial Cable Corrosion Protection Flow

4. ANSI/SCTE 12 2006: Test Method for Center Conductor Bond to Dielectric for Trunk, Feeder and Distribution Coaxial Cables

5. ANSI/SCTE 13 2006 : Dielectric Air Leakage Test Method For Trunk, Feeder and Distribution Coaxial Cable

6. ANSI/SCTE 32 2009: Ampacity of Coaxial Telecommunications Cables

7. ANSI/SCTE 33 2001: Test Method for Diameter of Drop Cable

8. ANSI/SCTE 39 2007: Test Method for Static Minimum Bending Radius for Coaxial Trunk, Feeder and Distribution Cables

9. ANSI/SCTE 49 2007: Test Method for Velocity of Propagation

10. ANSI/SCTE 63 2009: Test Method for Voltage Withstand of Outer Jacket

11. ANSI/SCTE 66 2008: Test Method for Coaxial Cable Impedance

12. ANSI/SCTE 69 2007: Test Method for Moisture Inhibitor Corrosion Resistance

13. ANSI/SCTE 88 2007: Test Method Polyethylene Jacket Longitudinal Shrinkage

14. ANSI/UL1581-2001: Reference Standard for Electrical Wires, Cables and Flexible Cords

15. ASTM A641-92: Zinc Coated (Galvanized) Carbon Steel Wire

16. ASTM B1-90: Standard Specification for Hard-Drawn Copper Wire

17. ASTM B3-90: Standard Specification for Soft or Annealed Copper Wire

18. ASTM B566: Standard Specification for Copper-Clad Aluminum Conductor

19. ASTM B694-86: Specification for Copper, Copper Alloy, and Copper Clad Stainless Steel Sheet and Strip for Electrical Cable Shielding

20. ASTM B869-96: Standard Specification for Copper-Clad Steel Electrical Conductor for CATV Drop Wire

21. ASTM D1248-02: Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable

22. ASTM D 4565: Physical and Environmental Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable

23. ASTM E8-01e1: Standard Test Methods for Tension Testing of Metallic Materials

24. SCTE 44 2010: Test Method for DC Loop Resistance

25. ANSI/SCTE 47 2007: Test Method for Coaxial Cable Attenuation

26. ANSI/SCTE 108 2006: Test Method for Dielectric Strength Withstand

11.0 INFORMATIVE REFERENCES

The following documents may provide valuable information to the reader but are not required when complying with this standard.

27. ANSI/SCTE 01 2006: “F” Port (Female Outdoor) Physical Dimensions

28. ANSI/SCTE 09 2005: Test Method for Cold Blend

29. ANSI/SCTE 31 2007: Test Method for Measuring Diameter Over Core

30. ANSI/SCTE 59 2007: Test Method for Drop Cable Center Conductor Bond to Dielectric

31. ANSI/SCTE 61 2007: Test Method for Jacket Web Separation

32. ANSI/SCTE 72 2007: Test Method for Insertion Force of Connector to Drop Cable Interface

33. SCTE 123 2006: “F” Port (Male Outdoor) Physical Dimension

34. ASTM B193-87: Resistivity of Electrical Conductive Materials

35. ASTM B227-88: Hard Drawn Copper Clad Steel Wire

36. ASTM B452-88: Copper Clad Steel Wire for Electronic Applications

37. IEEE: Standard Dictionary of Electrical and Electronic Terms

38. Jones Dictionary: Cable Television Terminology 3rd Edition

39. NFPA-70-1999: Community Antenna Television and Radio Distribution Systems

40. NEC Article 820: Community Antenna Television and Radio Distribution Systems

41. NEC Article 830: Network-Powered Broadband Communications Systems