Society of Cable Telecommunications Engineers

ENGINEERING COMMITTEE
Interface Practices Subcommittee

AMERICAN NATIONAL STANDARD

ANSI/SCTE 71 2008

Specification for Braided, 75 Ω, Coaxial, Multi-Purpose Cable

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INTRODUCTION

This specification is intended to apply to general-purpose flexible 75 ohm, Braided, Low Loss Multi-Purpose Cables.

When reference to other regulations or specifications is made, the user should adhere to the latest revision of the regulation or specification.

1.0 SCOPE

1.1 This specification defines the materials, electrical and mechanical properties of 75 ohm Braided, Low Loss Subscriber Access Cable (Series 15) as defined herein.

1.2 These cables are used in the transmission of RF signals and power for voice, data and video applications.

2.0 CENTER CONDUCTOR

2.1 The center conductor shall be copper clad aluminum. The outer layer of copper shall be metallurgically bonded and continually cover the aluminum core prior to processing; the composite applicable conductor shall meet requirements of ASTM BS66-43, Class 10A or 10H.

2.2 Solid copper center conductor may also be available if required by the user. Low DC resistance is the major advantage to using solid copper; therefore, this document will only cover copper clad aluminum.

2.3 Factory joints in the finished product shall be allowed. The ultimate tensile strength in the joint area when tested per ASTM F8-07e7 shall be 90% of the original unspliced wire.

2.4 Dimensions

2.4.1 Center conductor dimension shall be 0.109 ± 0.001 inches (2.769 ± 0.03 mm).

2.4.2 Mechanical - Minimum break strength (MBS) of the copper clad aluminum shall be determined by multiplying the minimum cross sectional area by 20,000 psi. (138 MPa). Minimum MBS for 0.109" (2.769 mm) conductor equals 187 lbf (84.8 kgf).

2.5 Electrical

2.5.1 The center conductor electrical conductivity shall be 62.5 percent IACS minimum.

2.5.2 Maximum DC Resistance shall be measured per ANSI/SCTE 44 2005, and shall be 1.42 ohms/1000 feet (4.66 ohms/km).

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 gas injected 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 8.1.4 Thermal Oxidative Stability (TOS).

3.2 Unless otherwise specified, polyethylene materials for the dielectric shall meet all applicable requirements of ASTM D 1248-02 and requirements of this document.

3.3 Nominal Dielectric Diameter – 0.455 inches (11.56 mm)

4.0 SHIELD CONSTRUCTION (TAPE & BRAID, TRISHIELD OR QUADSHIELD)

4.1 SINGLE TAPE & BRAID

4.1.1 LAMINATED SHIELDING TAPE (LST)

4.1.1.1 The first outer conductor shall be a Laminated Shielding Tape (LST). The LST shall be constructed of two aluminum foils laminated to a strength member and a bonding resin on one side. The LST shall have a maximum thickness of 0.0032 inches (81.28 microns) and a minimum thickness of 0.00186 inches (47.24 microns).

4.1.1.2 The LST shall overlap the dielectric circumference by 18 percent minimum to 35 percent maximum on the finished product.

4.1.1.3 The LST shall be applied longitudinally to the dielectric and shall be free of creases or twists over the entire length.

4.1.1.4 The average core diameter shall be determined by measuring the diameter over the LST in the finished product as described in ANSI/SCTE 31 2007. Average Core Diameter – 0.463 inches ± 0.008 inches (11.76 mm ± 0.20 mm).

4.1.1.5 Core ovality shall be determined by subtracting the measured minimum diameter from the measured maximum diameter over the LST in the finished product. Core Ovality Maximum – 0.018 inches (0.46 mm).

4.1.2 BRAID WIRE

4.1.2.1 The braiding wire shall be a round aluminum wire consisting of 33 AWG size. 0.0071 ± 0.0003 inches, (0.180 ± 0.01 mm) using an aluminum alloy of 5056, 5154, 5154A, or 5954.

4.1.2.2 Minimum tensile strength for individual strands of aluminum alloy braid wire shall be 43,000 psi.

4.1.2.3 Minimum elongation for individual strands of aluminum alloy braid wire shall be 3 percent.

4.1.2.4 Braid coverage over the first outer conductor shall be a minimum of 59 percent for single tape and braid products. The braid coverage shall be determined by ANSI/SCTE 51 2007.

4.2 TRISHIELD

4.2.1 LAMINATED SHIELDING TAPE (LST)

4.2.1.1 Refer to 4.1.1

4.2.2 BRAID WIRES

4.2.2.1 Refer to 4.1.2 except as indicated in 4.2.2.2 below.

4.2.2.2 Braid coverage over the first outer conductor shall be a minimum of 59 percent for trishield products. The braid coverage shall be determined by ANSI/SCTE 51 2007.

4.2.3 OUTER LAMINATED SHIELDING TAPE (LST)

4.2.3.1 An outer (LST) shall be applied over the Section 4.2.2 braid wires.

4.2.3.2 The outer LST shall be a laminated shielding tape constructed of two aluminum foils laminated to a central strength member with or without a bonding resin on one side.

4.2.3.3 The outer LST shall be applied longitudinally over the second outer conductor with an overlap of 18% minimum to 35% maximum and shall be free of creases, twists and discontinuities over the entire length.

4.3 QUADSHIELD

4.3.1 LAMINATED SHIELDING TAPE (LST)

4.3.1.1 Refer to 4.1.1

4.3.2 BRAID WIRES

4.3.2.1 Refer to 4.1.2 except as indicated in 4.3.2.2 below.

4.3.2.2 Braid coverage over the first outer conductor shall be a minimum of 59 percent for quadshield products. The braid coverage shall be determined by ANSI/SCTE 51 2007.

4.3.3 OUTER LAMINATED SHIELDING TAPE (LST)

4.3.3.1 Refer to 4.2.3.

4.3.4 OUTER BRAID WIRES

4.3.4.1 Refer to 4.1.2 except as indicated in 4.3.4.2 below.

4.3.4.2 Braid coverage over the outer LST shall be a minimum of 40 percent for Quadshield products. The braid coverage shall be determined by ANSI/SCTE 51 2007.

5.0 FLOODING COMPOUNDS

5.1 Cables for indoor, aerial or below grade applications may contain corrosion protection materials applied between the cable jacket and cable outer conductor. Corrosion protection shall be tested as described in ANSI/SCTE 69 2007.

5.2 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 JACKET

6.1 Polyvinylchloride (PVC) compound may be used for aerial and indoor applications.

6.2 Polyethylene (PE) compound may be used below grade or aerially.

6.3 The jacket material shall be UV stable, as defined in UL 1581-1985, paragraph 1200*, Reference Standard for Electric Wire, Cables and Flexible Cords.*

6.4 The diameter over the jacket shall be as shown in Table 6.0 when measured as described in ANSI/SCTE 33 2001.

Table 6.0, Jacket Diameter

Construction	inches (mm)
Tape & Braid	0.590 ± 0.010 (14.99 ± 0.254)
Trishield	0.595 ± 0.010 (15.11± 0.254)
Quadshield	0.623 ± 0.010 (15.82± 0.254)

7.0 INTEGRAL MESSENGER - OPTIONAL

7.1 Where utilized, the messenger shall be zinc coated (galvanized) carbon steel wire, as specified in ASTM A641-92. Table 7.0 lists the most commonly used sizes.

Table 7.0, Messenger Diameter

(inches)	(mm)
0.083 ± 0.003	2.11 ± 0.05
0.109 ± 0.003	2.77 ± 0.05

7.2 The zinc coating measured in ounces per square foot of surface shall meet Class 1 ASTM A641-92 specification.

7.3 The messenger minimum break strength (MBS) shall conform to the requirements of Table 7.1. The messenger minimum break strength is calculated by multiplying the minimum cross sectional area by the minimum tensile strength as specified in ASTM A641-92.

Table 7.1, Messenger Minimum Break Strength

Nominal Size inches (mm)	Pounds (Newtons)	Tensile (psi)
0.083 (2.11)	427 (1,899)	85,000
0.109 (2.77)	706 (3,140)	80,000

7.4 The messenger shall be one continuous length. Welds and butt splices are prohibited.

7.5 If utilized, the integral messenger must separate from the cable in the web area without leaving any visible signs of splits, holes or grooves as specified in ANSI/SCTE 61 2007.

7.6 CAUTION: A protruding ridge may exist that may need to be trimmed.

8.0 FINISHED PRODUCT TESTS

8.1 Mechanical

8.1.1 The cable shall withstand a Cold Bend Test at -40°F/C with PVC jacket and -67° F (-55° C) with PE jacket. No visible damage to the jacket is allowed, as described in ANSI/SCTE 09 2005.

8.1.2 The cable shall withstand an impact test without damaging the jacket. The test is to be conducted at 5° F (-15° C) for cables with PVC jackets and at -22° F (-30° C) for cables with PE jackets, as described in ANSI/SCTE 10 2001.

8.1.3 Jacket longitudinal shrinkage shall be no more than 5 percent of the length under test and tested per ANSI/SCTE 88 2007.

8.1.4 Thermal Oxidative Stability.

To ensure the desired life expectancy of the dielectric insulation, determine its Oxidative Induction Time (OIT) before and after aging at 90°C for 14 days by measuring OIT according to ASTM D 4565, Section 17. The test utilizes insulation removed from the completed cable and tested at 180°C ± 0.3°C. Requirements for OIT – Initial: 20 minutes minimum, after aging: 70 percent of initial value.

8.2 Electrical

8.2.1 Velocity of Propagation (Vp) shall be 87 percent minimum when measured per ANSI/SCTE 49 2007.

8.2.2 Impedance shall be 75 ± 3 ohms per ANSI/SCTE 66 2003.

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

8.2.4 When tested in accordance with ANSI/SCTE 44 2005 the maximum DC loop resistance @68°F (20°C) shall be as shown in Table 11.1:

TABLE 11.1, Maximum DC Loop Resistance @68°F (20°C)

Construction	Ohms/1000 FT (Ohms/km)
Tape & Braid	6.06 (19.88)
Trishield	3.95 (12.96)
Quadshield	4.05 (13.29)

8.2.5 The cable minimum ampacity shall be determined per ANSI/SCTE 32 2006 and shall be 41 amperes assuming 68°F (20°C) ambient temperature, current in both conductor and shield and a maximum center conductor and shield temperature or 149°F (65°C).

8.2.6 The maximum attenuation for all construction types shall be as specified in Table 11.2 per ANSI/SCTE 47 2007.

Table 11.2, Series 15 Maximum Attenuation @ 68˚F (20˚C)

Frequency (MHz)	dB/100ft	dB/100M
5	0.21	0.69
55	0.60	1.97
211	1.16	3.81
250	1.26	4.13
270	1.31	4.30
300	1.39	4.56
330	1.45	4.76
350	1.50	4.92
400	1.61	5.28
450	1.71	5.61
500	1.80	5.91
550	1.90	6.23
600	1.98	6.50
750	2.23	7.32
870	2.41	7.91
1002	2.59	8.50

8.2.7 The overall cable jacket integrity when tested in accordance with ANSI/SCTE 63 2007 shall pass a spark test at a minimum 2.5 kV rms to ensure the absence of faults in the jacket during manufacturing.

8.2.8 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 Cº) per ANSI/SCTE 108 2006.

9.0 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/SCTE 03 2007: Test Method for Coaxial Cable Structural Return Loss.

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

3. ANSI/SCTE 10 2001: Test Method for Flexible Coaxial Cable Impact Test.

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

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

6. ANSI/SCTE 32 2006: Ampacity of Coaxial Telecommunications Cables.

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

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

9. ANSI/SCTE 51 2007: Test Method for Determining Drop Cable Braid Coverage.

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

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

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

13. ANSI/UL1581-1985: Reference Standard for Electrical Wires, Cables and Flexible Cords.

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

15. ASTM B566-93: Standard Specification for Copper-Clad Aluminum Wire.

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

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

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

19. ANSI/SCTE 66 2003: Test Method for Coaxial Cable Impedance.

20. ANSI/SCTE 44 2005: Test Method for DC Loop Resistance.

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

22. ANSI/SCTE 108 2006: Test Method for Dielectric Withstand of Coaxial Cable

23. ANSI/SCTE 63 2007: Test Method for Voltage Withstand of Outer Jacket.

10.0 INFORMATIVE REFERENCES

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

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

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

26. ANSI/SCTE 78 2007: Test Method for Transfer Impedance.

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

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

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

30. IEEE: Standard Dictionary of Electrical and Electronic Terms.

31. Jones Dictionary: Cable Television Terminology 3rd Edition.

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

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

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

11.0 GLOSSARY

Attenuation: The decrease in magnitude of a wave as it travels through any transmitting medium, such as cable or circuitry. It is the difference between transmitted and received power.

Coaxial Cable: A type of cable used for broadband data and cable systems. Composed of a center conductor, insulating dielectric, conductive shield and optional protective covering. This type of cable has excellent broadband frequency characteristics, noise immunity and physical durability. Synonymous with Coax Drop Cable – In a cable telecommunications system the transmission cable from the distribution cable to a dwelling.

Conductivity: The ability of a material to allow electrons to flow, measured by the current per unit of voltage applied. It is the reciprocal of resistivity.

Core Ovality: The difference between the minimum and maximum dimensions over the first Laminated Shield Tape.

DC Resistance: The opposition a conductive material offers to current flow, measured in ohms.

DC Loop Resistance: A resistance measurement of the center conductor and outer conductor when connected in series (measured in ohms/1000 feet).

Dielectric: A nonconductive insulator material between the center conductor and outer conductor of coaxial cable.

Dielectric Withstand: The ability of the drop cable insulation to withstand a minimum of 1000 VAC.

Impedance: The total opposition a circuit, cable or component offers to alternating current flow. It includes both resistance and reactance and is generally expressed in ohms and designated by the symbol Z.