Society of Cable Telecommunications Engineers

ENGINEERING COMMITTEE
Interface Practices Subcommittee

AMERICAN NATIONAL STANDARD

ANSI/SCTE 74 2011

Specification for Braided 75 Ω Flexible RF Coaxial Drop Cable

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INTRODUCTION

This specification is intended to apply to flexible braided general-purpose type 75 ohm RF coaxial drop cables and not specialty cables. There are numerous reasons to standardize drop cable, but the primary reason is for proper cable to "F" fitting interface.

When reference to other regulations or specifications are 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 flexible braided 75 ohm coaxial drop cables.

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 Material

2.1.1 The center conductor shall be copper clad steel. The outer layer of copper shall be metallurgically bonded and continually cover the steel core prior to processing. The composite applicable conductor shall meet the requirements of ASTM B869.

2.1.2 Solid copper center conductor or copper clad aluminum center conductor may also be specified if required by the user.

2.1.3 Factory joints in the finished product shall be allowed. The ultimate tensile strength in the joint area when tested per ASTM E8 shall be 90% of the original unspliced wire.

2.2 Dimensions

2.2.1 Center conductor dimensions shall meet the requirements of Table 2.0.

2.2.2 All center conductor tolerances shall be ± 1%.

Table 2.0 Center Conductor Diameters				
Series	**59**	**6**	**7**	**11**
inches	0.032	0.0403	0.051	0.064
(mm)	0.81	1.02	1.30	1.63

2.2.3 Mechanical

Minimum break strength (MBS) of the copper clad steel conductor shall be determined by multiplying the minimum cross sectional area by 115,000 psi. (See Table 2.1).

Table 2.1 Center Conductor Minimum Break Strength				
Series	**59**	**6**	**7**	**11**
lbf	91	144	229	363
(kgf)	41.3	65.3	103.9	164.7

2.3 Electrical

2.3.1 The center conductor electrical conductivity shall be 18 percent IACS minimum.

2.3.2 Maximum DC Resistance shall be measured per ANSI/SCTE 44 2010 and shall meet the requirements of Table 2.2.

Table 2.2 Maximum Resistance in Ohms @ 68ºF (20ºC)				
Series	**59**	**6**	**7**	**11**
1000 ft	49.2	31.1	20.1	12.3
(km)	161.4	102.0	65.9	40.4

3.0 DIELECTRIC

3.1 Material

3.1.1 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).

3.1.2 Unless otherwise specified, polyethylene materials for the dielectric shall meet all applicable requirements of ASTM D1248 and requirements of this document.

3.2 Mechanical

Nominal Dielectric Diameter – (See Table 3.0)

Table 3.0 Nominal Dielectric Diameter				
Series	**59**	**6**	**7**	**11**
inches	0.144	0.180	0.225	0.280
(mm)	3.66	4.57	5.72	7.11

4.0 SHIELD CONSTRUCTIONS (SINGLE TAPE & BRAID, TRISHIELD, 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 (See Table 4.0).

Table 4.0 LST Thickness		
	Dimensions	
	max	min
Inches	0.0032	0.00186
(microns)	81.28	47.24

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.

4.1.2 CORE (DIELECTRIC + LST)

4.1.2.1 Average Core Diameter

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. See Table 4.1 for specifications.

Table 4.1 Average Core Diameter Specification				
Series	**59**	**6**	**7**	**11**
inches	0.152 ± 0.005	0.188 ± 0.005	0.233 ± 0.006	0.288 ± 0.006
(mm)	3.86 ± 0.13	4.78 ± 0.13	5.92 ± 0.15	7.32 ± 0.15

4.1.2.2 Core Ovality shall be determined by subtracting the measured minimum from the measured maximum diameter over the LST in the finished product. See Table 4.2 for specifications.

Table 4.2 Core Ovality Maximum				
Series	**59**	**6**	**7**	**11**
inches	0.011	0.013	0.015	0.015
(mm)	0.28	0.33	0.38	0.38

4.1.3 BRAID WIRE

4.1.3.1 Material

The braiding wire shall be a round aluminum wire consisting of 34 AWG (0.0063 ± 0.0003 inches), (0.160 ± 0.01 mm) using an aluminum alloy of 5056, 5154, 5154A, or 5954.

4.1.3.2 Mechanical

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

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

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.

4.1.3.3 Electrical

The maximum DC Loop Resistance for a Tri-Shield product shall be as specified in Table 8.2 and measured per ANSI/SCTE 44 2010.

4.1.3.4 Single Tape & Braid Jacket

See Section 6.0 for jacket material specifications.

4.2 TRI-SHIELD (THIRD SHIELD)

4.2.1 Material

The third shield shall be a Laminated Shielding Tape (LST). Construction of the LST may be one or two aluminum foils laminated to a strength member with or without a bonding resin on one side (See Table 4.3).

Table 4.3 Tri-Shield LST Thickness

	Dimensions	
	max	**min**
Inches	0.0032	0.0017
(microns)	81.28	43.18

4.2.2 Mechanical

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

The LST shall be applied longitudinally over the second shield and be free of creases or twists over the entire length.

4.2.3 Electrical

The maximum DC Loop Resistance for a Tri-Shield product shall be as specified in Table 8.2 and measured per ANSI/SCTE 44 2010.

4.2.4 Tri-Shield Jacket

See Section 6.0 for jacket material specifications.

4.3 QUAD-SHIELD (FOURTH SHIELD)

4.3.1 LAMINATED SHIELDING TAPE

4.3.1.1 Refer to 4.2.1

4.3.2 BRAID WIRE

4.3.2.1 Refer to 4.1.3 except as indicated in 4.3.1.2 below.

4.3.2.2 Braid coverage over the fourth outer conductor shall be a minimum of 32 percent.

4.3.2.3 Electrical

The maximum DC loop resistance for a quad-shield product shall be as specified in Table 8.2 and shall be measured per ANSI/SCTE 44 2010.

4.3.2.4 Quad-Shield Jacket

See Section 6.0 for jacket material specifications.

Quad-Shield Diameter Over Jacket (DOJ) – (See Table 6.0).

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 Material

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

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

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

6.2 Mechanical

The diameter over the jacket (DOJ) shall be measured as described in ANSI/SCTE 33 2010 (See Table 6.0 for cable DOJ).

Table 6.0 Diameter Over Jacket (DOJ)		
Series/Construction	**Inches**	**(mm)**
59 Single Tape & Braid	0.240 ± 0.008	(6.10 ± 0.200)
59 Tri-Shield	0.244 ± 0.008	(6.20 ± 0.200)
59 Quad-Shield	0.265 ± 0.008	(6.73 ± 0.200)
6 Single Tape & Braid	0.273 ± 0.008	(6.93 ± 0.200)
6 Tri-Shield	0.278 ± 0.008	(7.06 ± 0.008)
6 Quad-Shield	0.297 ± 0.008	(7.54 ± 0.200)
7 Single Tape & Braid	0.319 ± 0.008	(8.10 ± 0.200)
7 Tri-Shield	0.323 ± 0.008	(8.20 ± 0.200)
7 Quad-Shield	0.340 ± 0.008	(8.64 ± 0.200)
11 Single Tape & Braid	0.400 ± 0.010	(10.16 ± 0.250)
11 Tri-Shield	0.400 ± 0.010	(10.16 ± 0.250)
11 Quad-Shield	0.407 ± 0.010	(10.34 ± 0.250)

6.3 Integral Messenger (IM) Web

6.3.1 If utilized, the IM 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.

6.3.1.1 A very small ridge protruding above the cable will be permissible after separation.

7.0 INTEGRAL MESSENGER - OPTIONAL

7.1 Material

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

Table 7.0 Messenger Diameters	
(inches)	**(mm)**
0.051 ± 0.002	1.30 ± 0.05
0.063 ± 0.002	1.60 ± 0.05
0.072 ± 0.002	1.83 ± 0.05
0.083 ± 0.003	2.11 ± 0.05
0.109 ± 0.003	2.77 ± 0.05

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

7.2 Mechanical

7.2.1 Messenger Minimum Break Strength – (See Table 7.1).

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

Table 7.1 Messenger Minimum Break Strength (MBS)			
Nominal Size	**lbf**	**kgf**	**Tensile (psi)**
0.051	170	77.1	90,000
0.063	263	119.3	90,000
0.072	346	156.9	90,000
0.083	427	193.7	85,000
0.109	706	320.2	80,000

7.2.1.2 The MBS is calculated by multiplying the minimum cross sectional area by the minimum tensile strength as specified in ASTM A641.

8.0 FINISHED PRODUCT TESTS

8.1 Mechanical

8.1.1 The cable must be able to 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 2010.

8.1.2 The cable must be able to 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 2008

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 D4565, Section 17. The test utilizes insulation removed from the completed cable and tested at 180°C ± 0.3C°. Requirements for OIT – Initial: 20 minutes minimum, after aging: 70 percent of initial value.

8.1.5 If required, insertion force designed to measure the amount of linear force to install an "F" connector onto a drop cable may be measured as described in ANSI/SCTE 73 2007.

8.1.6 Center conductor bond to dielectric shall be as specified in Table 8.0 and measured per ANSI/SCTE 59 2007.

Table 8.0 Center Conductor Bond To Dielectric				
Series	**59**	**6**	**7**	**11**
Minimum lbs	5	5	8	15
Minimum (kg)	2.3	2.3	3.6	6.8

8.2 Electrical

The maximum attenuation for all construction types shall be as specified in Table 8.1 per ANSI/SCTE 47 2007.

Table 8.1 Drop Cable Maximum Attenuation @ 68˚F (20˚C)								
Series	59		6		7		11	
Frequency (MHz)	dB/100ft	(dB/100m)	dB/100ft	(dB/100m)	dB/100ft	(dB/100m)	dB/100ft	(dB/100m)
5	0.86	2.82	0.58	1.90	0.47	1.54	0.38	1.25
55	2.05	6.73	1.60	5.25	1.25	4.10	0.96	3.15
211	3.80	12.47	3.05	10.00	2.36	7.74	1.90	6.23
250	4.10	13.45	3.30	10.82	2.56	8.40	2.05	6.72
270	4.22	13.85	3.37	11.04	2.68	8.78	2.13	7.00
300	4.45	14.60	3.55	11.64	2.82	9.25	2.25	7.38
330	4.66	15.29	3.74	12.26	2.96	9.72	2.35	7.71
350	4.80	15.75	3.85	12.63	3.05	10.01	2.42	7.94
400	5.10	16.73	4.15	13.61	3.27	10.73	2.60	8.53
450	5.40	17.72	4.40	14.43	3.46	11.35	2.75	9.02
500	5.7	18.7	4.66	15.29	3.67	12.04	2.90	9.51
550	5.95	19.52	4.90	16.08	3.85	12.63	3.04	9.97
600	6.2	20.34	5.10	16.73	4.05	13.28	3.18	10.43
750	6.97	22.87	5.65	18.54	4.57	14.99	3.65	11.97
870	7.57	24.85	6.11	20.04	4.96	16.28	4.06	13.31
1000	8.12	26.64	6.55	21.49	5.32	17.45	4.35	14.27

8.2.1 Velocity of Propagation (Vp) shall be 82 percent minimum when measured per ANSI/SCTE 49 2007.

8.2.2 Impedance shall be 75 ± 3 ohms per ANSI/SCTE 2008.

8.2.3 Minimum Structural Return Loss shall be -20 dB in the frequency range 5 – 1000 MHz. per ANSI/SCTE 03 2008.

8.2.4 The maximum DC Loop Resistance shall be tested per ANSI/SCTE 44 2010 and shall meet requirements of Table 8.2.

Table 8.2 Maximum DC Loop Resistance @ 68°F (20°C)

Series/Construction	**ohms/1000 ft.**	**(ohms/km)**
59 Single Tape & Braid	60.88	(199.7)
59 Tri-Shield	58.0	(190.3)
59 Quad-Shield	56.1	(184.1)
6 Single Tape & Braid	41.16	(135.0)
6 Tri-Shield	38.4	(126.1)
6 Quad-Shield	36.9	(121.1)
7 Single Tape & Braid	27.8	(91.2)
7 Tri-Shield	24.8	(81.4)
7 Quad-Shield	24.4	(80.0)
11 Single Tape & Braid	20.0	(65.6)
11 Tri-Shield	17.4	(57.1)
11 Quad-Shield	16.7	(54.8)

8.2.5 The cable minimum ampacity in both conductors shall be determined per ANSI/SCTE 32 2009 and shall meet requirements of Table 8.3.

Table 8.3 Coaxial Drop Cable Ampacity (Amperes)		
Cable Series	**20°C Ambient**	**40°C Ambient**
59 Series		
Tape & Braid	6	4
Tri-shield	6	4
Quad-shield	6	5
6 Series		
Tape & Braid	8	6
Tri-shield	8	6
Quad-shield	8	6
7 Series		
Tape & Braid	10	7
Tri-shield	10	8
Quad-shield	10	8
11 Series		
Tape & Braid	13	10
Tri-shield	13	10
Quad-shield	13	10

8.2.6 Transfer Impedance (Z_T milliohms/meter) shall be determined per ANSI/SCTE 78 2007.

8.2.7 The overall cable jacket integrity shall be subject to a spark test with 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 2008: Test Method for Coaxial Cable Structural Return Loss.
2. ANSI/SCTE 09 2010: Test Method for Cold Blend.
3. ANSI/SCTE 10 2008: Test Method 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 2009: Ampacity of Coaxial Telecommunications Cables.
7. ANSI/SCTE 33 2010 Test Method for Diameter of Drop Cable.
8. ANSI/SCTE 44 2010: Test Method for DC Loop Resistance.
9. ANSI/SCTE 47 2007: Test Method for Coaxial Cable Attenuation.
10. ANSI/SCTE 49 2007: Test Method for Velocity of Propagation.
11. ANSI/SCTE 51 2007:Test Method for Determining Drop Cable Braid Coverage.
12. ANSI/SCTE 59 2007: Test Method for Drop Cable Center Conductor Bond to Dielectric.
13. ANSI/SCTE 61 2007: Test Method for Jacket Web Separation.
14. ANSI/SCTE 69 2007: Test Method for Moisture Inhibitor Corrosion Resistance.
15. ANSI/SCTE 73 2007 Test Method for Insertion Force of Connector to Drop Cable Interface.
16. ANSI/SCTE 78 2007: Test Method for Transfer Impedance.
17. ANSI/SCTE 88 2007:Test Method for Polyethylene Jacket Longitudinal Shrinkage.
18. ANSI/SCTE 108 2006: Test Method for Dielectric Strength Withstand.
19. ANSI/UL1581-2001: Reference Standard for Electrical Wires, Cables and Flexible Cords.
20. ASTM A641/A641M-09a: Standard Specification for Zinc Coated (Galvanized) Carbon Steel Wire.

21. ASTM B1-01(2007): Standard Specification for Hard-Drawn Copper Wire.

22. ASTM B3-01(2007): Standard Specification for Soft or Annealed Copper Wire.

23. ASTM B869-07: Standard Specification for Copper-Clad Steel Electrical Conductor for CATV Drop Wire.

24. ASTM D1248-05: Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable.

25. ASTM D 4565-99(2004): Standard Test Methods for Physical and Environmental Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable.

26. ASTM E8/E8M-09: Standard Test Methods for Tension Testing of Metallic Materials.

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

10.0 INFORMATIVE REFERENCES

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

28. ANSI/SCTE 01 2006: "F" Port (Female Outdoor) Physical Dimensions.

29. ASTM B193-02(2008): Resistivity of Electrical Conductive Materials.

30. ASTM B227-04: Hard-Drawn Copper-Clad Steel Wire.

31. ASTM B452-09: Standard Specification for Copper-Clad Steel Wire for Electronic Applications.

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

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

34. National Electrical Code© (NEC) a.k.a. NFPA 70 2008, Articles 820 and 830.

35. ANSI/SCTE 123 2006: "F" Port (Male Outdoor) Physical Dimensions

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.

"F" Connector: Although a generic term, this could be any number of types or designs and typically described as "F" fitting or "F" male plug (also see ANSI/SCTE 01 2006 2001 and ANSI/SCTE 123 2006). An "F" connector is the interface between cable and equipment.

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.

Insertion Force: The force required to push an "F" connector onto a drop cable.