Society of Cable Telecommunications Engineers

ENGINEERING COMMITTEE
Interface Practices Subcommittee

AMERICAN NATIONAL STANDARD

ANSI/SCTE 32 2016

Ampacity of Coaxial Telecommunications Cables

NOTICE

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Table of Contents

List of Tables

1. Scope

This document provides the current carrying capacity or AMPACITY of coaxial cables used in the Telecommunications industry. The method used to calculate the tabulated ampacities is a thermodynamic model of a cable installed indoors in air and considers the heat flow from the inner and outer conductor through the dielectric and jacket materials. It assumes that the conductors carrying current reach an operating temperature of 65°C based on the cables ability to dissipate heat. This temperature was chosen to substantially minimize the possibility of accelerated thermal aging of the dielectric and jacket materials. System designers are encouraged to consider the effect of this operating temperature on conductor resistance (R), voltage drop (IR) and power consumption (I2R).

The National Electrical Code (NEC) considers the most convenient and expeditious method of defining the ampacity of cables to be through the use of tables. The tabular format included in this document illustrates the ampacity of trunk, distribution and drop type coaxial cables commonly used in the Telecommunications industry. This procedure ***shall not*** be used to determine ground conductor size as referenced in NEC Article 810, 820 or 830 as applicable.

The ampacity provided for trunk and distribution coaxial cables are for copper-clad aluminum center conductors and solid (smooth wall) aluminum outer conductors. Drop coaxial cable ampacity relate to cables with a copper-clad steel center conductor and a combination of aluminum tape(s) and braid(s), which represent the outer conductor.

2. Normative References

The following documents contain provisions, which, through reference in this text, constitute provisions of the standard. At the time of Subcommittee approval, the editions indicated were valid. All standards are subject to revision; and while parties to any agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the documents listed below, they are reminded that newer editions of those documents may not be compatible with the referenced version.

2.1. SCTE References

2.2. Standards from other Organizations

- No references apply at this time

3. Informative References

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

- TFC Technical Note 1075, Alan J. Amato, Times Fiber Communications.
- The National Electrical Code Handbook
- The Calculation of the Temperature Rise and Load Capability of Cable, J.H. Neher and M.H. McGrath, AIEE, March 1957.
- The Current Carrying Capacity of Rubber Insulated Conductors, S.J. Rosch, AIEE, 4/38.

4. Compliance Notation

shall	This word or the adjective "***required***" means that the item is an absolute requirement of this specification.
shall not	This phrase means that the item is an absolute prohibition of this specification.
forbidden	This word means the value specified shall never be used.
should	This word or the adjective "*recommended*" means that there may exist valid reasons in particular circumstances to ignore this item, but the full implications should be understood and the case carefully weighted before choosing a different course.
should not	This phrase means that there may exist valid reasons in particular circumstances when the listed behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
may	This word or the adjective "*optional*" means that this item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because it enhances the product, for example; another vendor may omit the same item.
deprecated	Use is permissible for legacy purposes only. Deprecated features may be removed from future versions of the standard. Implementations should avoid use of deprecated features.

5. Ampacity Reference Tables

Table 1 – Trunk and Distribution Cable Ampacity

Trunk and Distribution Cable Ampacity (in Amperes) **F=FOAM, D=DISC & AIR**		
Cable Series	**Current in Both Conductors**	
	20°C (68°F) Ambient	**40°C (104°F) Ambient**
412-F	33	25
440-D	41	31
500-F	43	32
500-D	49	36
540-F	50	37
565-F	50	38
625-F	54	40
650-D	64	48
700-F	66	49
715-F	68	51
750-F	67	50
750-D	79	59
840-F	79	59
860-F	84	62
875-F	81	60
1000-F	94	71
1000-D	108	80
1125-F	112	83
1160-F	117	87

Table 2 – Drop Cable Ampacity

Drop Cable Ampacity (in Amperes)		
Cable Series	**Current in Both Conductors**	
	20°C (68°F) Ambient	**40°C (104°F) 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 (Braid)	8	6
7 Series		
Tape & Braid	10	7
Tri-Shield (Braid)	10	8
Quad-Shield (Braid)	10	8
11 Series		
Tape & Braid	13	10
Tri-Shield	13	10
Quad-Shield	13	10

6. Engineering Supervision

When calculating the ampacity of coaxial cables the worst case condition is typically considered. Since indoor cables do not benefit from cooling from wind, it is assumed cables installed indoors or in enclosed areas represent the worst case scenario.

Under engineering supervision and guidance, ampacities for coaxial cables can be calculated by solving the following simultaneous equations:

$$I = \sqrt{\frac{t_c - t_s}{(R_{ic} - R_{eoc}) * (R_{th})}}$$

and

$$I = \sqrt{\frac{0.182 * \varepsilon * D * (t_s - t_a) + 0.0714 * D^{0.75} * (t_s - t_a)^{1.25}}{(R_{ic} - R_{eoc}) * (n)}}$$

The ampacities calculated from these general equations are considered to represent current flowing in both the center *and* outer conductors of a coaxial cable.

In the provided equations, R_{eoc} is the effective increase in center conductor resistance due to the effects of the outer conductor and is calculated as follows:

$$R_{eoc} = \frac{R_{th} - R_i}{R_{th}} * R_{oc}$$

R_{th} is the total thermal resistance to heat flow from the center conductor to the ambient air and is calculated by summing the insulation and jacket thermal resistance. The metallic components of the cable construction are considered to be isotherms and therefore disregarded.

$$R_{th} = R_i + R_j$$

Where

$$R_i = 0.00522 * \rho_i * \ln \frac{C}{d}$$

and

$$R_j = 0.00522 * \rho_j * \ln \frac{D}{D_s}$$

7. Variables

The variables used in the previous equations are defined as follows:

Variable	Meaning
I	Ampacity (Amperes)
t_c	Conductor operating temperature (°C)
t_a	Ambient temperature (°C)
t_s	Cable surface temperature (°C)
R_{ic}	Inner conductor resistance (Ω/ft at t_c)
R_{oc}	Outer conductor resistance (Ω/ft at t_c)
R_{eoc}	Increase in R_{ic} due to outer conductor
R_{th}	Total thermal resistance of circuit (°C/watt/ft)
R_i	Thermal resistance of dielectric (°C/watt/ft)
R_j	Thermal resistance of jacket (°C/watt/ft)
ε	Surface emissivity (jacketed=0.95, bare=0.35)
ρ_I	Thermal resistivity of the dielectric material
	1300 °C/watt/ft for both foam and disc & air dielectrics
ρ_j	Thermal resistivity of the jacket material
	400 °C/watt/ft for polyethylene (PE) jackets
	350 °C/watt/ft for polyvinylchloride (PVC) jackets
ln	Natural logarithm
n	Number of cables
d	Center conductor diameter (inches)
C	Insulation diameter (inches)
D_s	Outer conductor diameter (inches)
D	Jacket diameter (inches)