Table 50.139.1 Continued

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)[b]	Minimum tensile strength[b]
Aged in a full-draft circulating-air oven for 48 h (75°C or 167°F insulation, or 60°C or 140°F insulation) at 100.0 ±1.0°C (212.0 ±1.8°F)	75 percent of the result with unaged specimens	75 percent of the result with unaged specimens

[a] FRPP designates a thermoplastic compound whose characteristic constituent is polypropylene, the crystalline copolymer of ethylene and propylene.

[b] FRPP is to be tested at a speed of 2.0 ±0.2 in/min or 50 ±5 mm/min.

Table 50.140
Physical properties of PVC[a] insulation from Type TW wire

Table deleted

Table 50.142
Physical properties of PVC[a] insulations and jackets from medium- and low-power broadband cables rated for 105, 90, 75, and 60°C

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	100 percent (1 inch or 25 mm)	2000 lbf/in^2 or 13.79 MPa
105°C insulations and jackets:	Die-cut and other specimens:	Die-cut and other specimens:
Aged in a full-draft circulating-air oven for 168 h at 136.0 ±1.0°C (276.8 ±1.8°F)	50 percent of the result with unaged specimens	85 percent of the result with unaged specimens
90°C insulations and jackets:	Die-cut and other specimens:	Die-cut and other specimens:
Aged in a full-draft circulating air oven for 168 h at 121.0 ±1.0°C (249.8 ±1.8°F)	50 percent of the result with unaged specimens	85 percent of the result with unaged specimens
75°C insulations and jackets:	Die-cut and other specimens:	Die-cut and other specimens:
Aged in a full-draft circulating-air oven for 240 h at 100.0 ±1.0°C (212.0 ±1.8°F)	50 percent of the result with unaged specimens	85 percent of the result with unaged specimens
60°C insulations and jackets:	Die-cut and other specimens:	Die-cut and other specimens:
Aged in a full-draft circulating-air oven for 168 h at 100.0 ±1.0°C (212.0 ±1.8°F)	50 percent of the result with unaged specimens	75 percent of the result with unaged specimens

[a] PVC designates a thermoplastic compound whose characteristic constituent is polyvinyl chloride or a copolymer of vinyl chloride and vinyl acetate.

Table 50.144
Physical properties of insulation of thermoplastic other than PVC from Type NM cables

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)		Minimum tensile strength
Unaged	Values as established for the particular commercial or proprietary compound used		
Insulation from conductors of NM (nylon removed before aging):	Die-cut specimens:	Other specimens:	All specimens:
Aged in a full-draft circulating-air oven for 168 h at 136.0 ±1.0°C (276.8 ±1.8°F)	45 percent of the result with unaged specimens	65 percent of the result with unaged specimens	75 percent of the result with unaged specimens

Table 50.145
Physical properties of PVC[a] insulation from Type THW and THWN wires
Table deleted

Table 50.150
Physical properties of PVC[a] insulation from gasoline- and oil-resistant Type TFN, and TFFN

Condition of PVC specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged (nylon removed)	150 percent (1-1/2 inches or 38 mm)	2000 lbf/in^2 or 13.79 MPa
Conditioned by immersion in water-saturated ASTM Reference Fuel C for 30 d at 23.0 ±1.0°C (73.4 ±1.8°F) with nylon intact during immersion and removed prior to testing	65 percent of the result with unaged specimens	75 percent of the result with unaged specimens
[a] PVC designates a thermoplastic compound whose characteristic constituent is polyvinyl chloride or a copolymer of vinyl chloride and vinyl acetate.		

Table 50.155
Physical properties of PVC insulation from Type TFN and TFFN fixture wires

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	150 percent (1-1/2 inches or 37.5 mm)	2000 lbf/in^2 or 13.79 MPa
Aged in a full-draft circulating-air oven for 168 h at 136.0 ±1.0°C (276.8 ±1.8°F) with nylon jacket removed before aging	Die-cut specimens: 45 percent of the result with unaged specimens Other specimens: 65 percent of the result with unaged specimens	All specimens: 75 percent of the result with unaged specimens
[a] PVC designates a thermoplastic compound whose characteristic constituent is polyvinyl chloride or a copolymer of vinyl chloride and vinyl acetate.		

Table 50.156
Physical properties of oil-resistant TFN and TFFN PVC[a] insulation

Oil-resistant rating of wire	Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)
75°C (167°F)	Aged in oil for 60 d at 75.0 ±1.0°C (167.0 ±1.8°F)	65 percent of the result with unaged specimens
60°C (140°F)	Aged in oil for 96 h at 100.0 ±1.0°C (212.0 ±1.8°F)	50 percent of the result with unaged specimens

[a] PVC is described in note [a] to Table 50.155.

Table 50.160
Physical properties of PVC insulation from Type TBS wire

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	100 percent (1 inch or 25 mm)	1500 lbf/in^2 or 10.3 MPa
Aged in a full-draft circulating-air oven for 168 h at 121.0 ±1.0°C (249.8 ±1.8°F) with all materials over the thermoplastic insulation removed before aging	Die-cut specimens: 45 percent of result with unaged specimens Other specimens: 65 percent of result with unaged specimens	Die-cut specimens: 70 percent of the result with unaged specimens Other specimens: 70 percent of the result with unaged specimens

[a] PVC designates a thermoplastic compound whose characteristic constituent is polyvinyl chloride or a copolymer of vinyl chloride and vinyl acetate.

Table 50.165
Physical properties of Class 11 60°C (140°F) PVC[a] insulation
Table deleted

Table 50.166
Physical properties of Class 11 60°C (140°F) PVC[a] insulation and jacket
Table deleted

Table 50.167
Physical properties of Class 11 60°C (140°F) PVC[a] jacket
Table deleted

Table 50.169
Physical properties of Class 11 60°C (140°F) PVC[a] insulation and jacket
Table deleted

Table 50.172
Physical properties of Class 11 60°C (140°F) PVC[a] jacket
Table deleted

Table 50.175
Physical properties of PVC[a] jacket from cable for deep-well submersible water pumps

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	100 percent (1 inch or 25 mm)	1500 lbf/in^2 or 10.3 MPa
Aged in a full-draft circulating-air oven for 168 h at 100.0 ±1.0°C (212.0 ±1.8°F)	Die-cut specimens: 45 percent of the result with unaged specimens Other specimens: 65 percent of the result with unaged specimens	Die-cut Specimens: 65 percent of the result with unaged specimens Other specimens: 65 percent of the result with unaged specimens

[a] PVC designates a thermoplastic compound whose characteristic constituent is polyvinyl chloride or a copolymer of vinyl chloride and vinyl acetate.

Table 50.179
Physical properties of NM Cable PVC[a] jacket

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	100 percent (1 inch or 25 mm)	1500 lbf/in^2 or 10.3 MPa
Aged for 240 h in a full-draft circulating-air oven at 100.0 ±1.0°C (212.0 ±1.8°F)	Die-cut specimens: 45 percent of the result with unaged specimens Other specimens: 65 percent of the result with unaged specimens	Die-cut specimens: 70 percent of the result with unaged specimens Other specimens: 70 percent of the result with unaged specimens

[a] Designates a thermoplastic compound whose characteristic constituent is polyvinyl chloride or a copolymer of vinyl chloride and vinyl acetate.

Table 50.180
Physical properties of Class 12 90°C (194°F) PVC[a] insulation and jacket
Table deleted

Table 50.181
Physical properties of Class 12 105°C (221°F) PVC[a] insulation and jacket
Table deleted

Table 50.182
Physical properties of 60°C, 75°C, 90°C, and 105°C PVC[a] jackets from CATV cables, and insulations and jackets from power-limited circuit cable, from cable for power-limited fire-alarm circuits, or from other cables

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	100 percent (1 inch or 25 mm)	1500 lbf/in^2 or 10.3 MPa
Aged in a full-draft circulating-air oven for the specified time at the specified temperature[b]	Die-cut specimens: 45 percent of the result with unaged specimens Other specimens:	Die-cut specimens: 70 percent of the result with unaged specimens Other specimens:

Table 50.182 Continued on Next Page

Table 50.182 Continued

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
	65 percent of the result with unaged specimens	70 percent of the result with unaged specimens
60°C oil-resistant jacket:		
Aged in oil for 168 h at 60.0 ±1.0°C (140.0 ±1.8°F)	75 percent of the result with unaged specimens	75 percent of the result with unaged specimens
60°C oil-resistant insulation:		
Aged in oil for 168 h at 60.0 ±1.0°C (140.0 ±1.8°F)	85 percent of the result with unaged specimens	85 percent of the result with unaged specimens
60°C oil-resistant uses other than in flexible cords and elevator cables:		
Aged in oil for 60 d at 60.0 ±1.0°C (140 ±1.8°F)	75 percent of the result with unaged specimens	75 percent of the result with unaged specimens
75°C oil resistant insulation		
Aged in oil for 60 d at 75.0 ±1.0°C (167 ±1.8°F)	65 percent of the result with unaged specimens	65 percent of the result with unaged specimens

[a] PVC designates a thermoplastic compound whose characteristic constituent is polyvinyl chloride or a copolymer of vinyl chloride and vinyl acetate.

[b] The oven time and temperature are to be as follows:

	Specified oven time and temperature	
Temperature rating of material	h	°C (°F)
60°C	168	100.0 ±1.0°C (212.0±1.8°F)
75°C	240	100.0 ±1.0°C (212.0 ±1.8°F)
90°C	168	121.0 ±1.0°C (249.8 ±1.8°F)
105°C	168	136.0 ±1.0°C (276.8 ±1.8°F)

Table 50.183
Physical properties of 105°C, 90°C, 75°C, and 60°C semirigid PVC[a] insulations and 75°C and 60°C jackets from CATV cables, from power-limited circuit cable, from cable for power-limited fire-alarm circuits, and from other cables

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)[b]	Minimum tensile strength[b]
Unaged	100 percent (1 inch or 25 mm)	3000 lbf/in^2 or 20.7 MPa

Table 50.183 Continued on Next Page

Table 50.183 Continued

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)[b]	Minimum tensile strength[b]
Aged in a full-draft circulating-air oven for the specified time[c] at the specified temperature[c]	70 percent of the result with unaged specimens[d]	70 percent of the result with unaged specimens[d]

[a] Semirigid PVC (SRPVC) designates a partially plasticized thermoplastic compound whose characteristic constituent is polyvinyl chloride or a copolymer of vinyl chloride and vinyl acetate.

[b] Semirigid PVC is to be tested at a speed of 2.0 ±0.2 in/min or 50 ±5 mm/min.

[c] The oven time and temperature are to be as follows:

Temperature rating of material	Specified oven time and temperature	
	h	°C (°F)
105°C	168	136.0 ±1.0°C (276.8±1.8°F)
90°C	168	121.0 ±1.0°C (249.8 ±1.8°F)
75°C	168	113.0 ±1.0°C (235.4 ±1.8°F)
60°C	168	100.0 ±1.0°C (212.0 ±1.8°F)

[d] As an alternative to testing for retention of tensile strength and elongation, it is appropriate to wind aged specimens of the 60°C insulation in place on the conductor onto a mandrel as described under "Flexibility" in the applicable wire Standard. Unaged specimens are to be tested for tensile strength and elongation. Where aged specimens that are tested for retention of tensile strength and elongation show results that do not comply, it is appropriate to use the flexibility procedure described under "Flexibility" as a referee test.

Table 50.184
Physical properties of 60°C, 75°C, and 80°C insulations and jackets of a blend of PVC[a] and TPU[a]

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)[b]	Minimum tensile strength[b]
Unaged	100 percent (1 inch or 25 mm)	1500 lbf/in^2 or 10.3 MPa
Specimens of 60°C material: Aged in a full-draft-circulating-air oven for 168 h at 100.0 ±1.0°C (212.0 ±1.8°F)	Die-cut specimens: 45 percent of the result with unaged specimens Other specimens: 65 percent of the result with unaged specimens	70 percent of the result with unaged specimens
Specimens of 75°C material: Aged in a full-draft-circulating-air oven for 240 h at 100.0 ±1.0°C (212.0 ±1.8°F)	Die-cut specimens: 45 percent of the result with unaged specimens Other specimens: 65 percent of the result with unaged specimens	70 percent of the result with unaged specimens
Specimens of 80°C material: Aged in a full-draft-circulating-air oven for 168 h at 113.0 ±1.0°C (235.0 ±1.8°F)	Die-cut specimens: 45 percent of the result with unaged specimens	70 percent of the result with unaged specimens

Table 50.184 Continued on Next Page

Table 50.184 Continued

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)[b]	Minimum tensile strength[b]
	Other specimens: 65 percent of the result with unaged specimens	

[a] PVC designates a thermoplastic compound whose characteristic constituent is polyvinyl chloride or a copolymer of vinyl chloride and vinyl acetate. TPU designates thermoplastic polyurethane, a compounded thermoplastic elastomer material whose main constituent is a polyester- or polyether-based urethane linear polymer resin characterized by soft amorphous segments containing hard crystalline microdomains.

[b] A blend of PVC and TPU is to be tested at a speed of 20 ±1 in/min or 500 ±25 mm/min.

Table 50.185
Physical properties of 150°C and 125°C PVDF[a] and PVDF copolymer[b] jackets from CATV cables; and insulations and jackets from power-limited circuit cable and from cable for power-limited fire-alarm circuits

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)[c]	Minimum tensile strength[c]
Unaged	100 percent (1 inch or 25 mm)	3500 lbf/in^2 or 24.1 MPa
Specimens of 150°C material:		
Aged in a full-draft circulating-air oven for 60 d at 158.0 ±1.0°C (316.4 ±1.8°F)	50 percent of the result with unaged specimens	50 percent of the result with unaged specimens
Specimens of 125°C material:		
Aged in a full-draft circulating-air oven for 168 h at 158.0 ±1.0°C (316.4 ±1.8°F)	See note[d]	See note[d]
or		
as an option for PVDF copolymer only: aged in a full-draft circulating-air oven for 30 d at 136.0 ±1.0°C (276.8 ±1.8°F)	See note[d]	See note[d]

[a] PVDF designates a thermoplastic material whose characteristic constituent is the homopolymer resin polyvinylidene fluoride. The material is uncompounded PVDF to which it is appropriate to add a small amount of pigment, lubricant, or both.

[b] PVDF copolymer designates a thermoplastic material whose characteristic constituent is a copolymer of polyvinylidene fluoride and hexafluoropropylene. The material is the uncompounded polymer to which it is appropriate to add a small amount of pigment, lubricant, or both.

[c] PVDF and PVDF copolymer are to be tested at a speed of 2.0±0.2 in/min or 50 ±5 mm/min.

[d] Aged specimens of the jacket, of the foamed insulation in place on the conductor, or the solid insulation in place on the conductor are to be wound onto a mandrel as described under "Flexibility" in the applicable wire Standard. Unaged specimens of the jacket and of the solid insulation are to be tested for tensile strength and elongation. Jacket damage after aging caused by outgassing of lower-temperature insulated conductors within the cable does not constitute noncomplying performance.

Table 50.189
Physical properties of SBR/IIR/NR[a] insulation from Type USE and USE-2 wires

Condition of specimens at time of measurement	Maximum set for 75°C (167°F) compounds – inapplicable for 90°C (194°F) compounds (1-inch or 25-mm bench marks stretched to 2-1/2 inches or 62.5 mm)	Maximum set for 90°C (194°F) compounds – inapplicable for 75°C (167°F) compounds (1-inch or 25-mm bench marks stretched to 3 inches or 75 mm)	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	25 percent (1/4 inch or 6.2 mm)	25 percent (1/4 inch or 6.2 mm)	300 percent (3 inches or 75 mm)	700 lbf/in^2 or 4.83 MPa
75°C (167°F) compounds aged in a full-draft circulating-air oven for 240 h at 100.0 ±1.0°C (212.0 ±1.8°F)	Not measured	–	50 percent of the result with unaged specimens	70 percent of the result with unaged specimens
90°C (194°F) compounds aged in a full-draft circulating-air oven for 168 h at 121.0 ±1.0°C (249.8 ±1.8°F)	–	Not measured	60 percent of the result with unaged specimens	60 percent of the result with unaged specimens

[a] SBR/IIR/NR designates a thermoset compound whose characteristic constituent is SBR, IIR (butyl rubber), blends of SBR and IIR, or blends of SBR and/or IIR with NR (natural rubber). These thermosets are for use where subjected to 75°C (167°F) and lower temperatures as insulation on NBR/PVC-, CP-, Thermoset CPE-, XL-, or neoprene-jacketed or fibrous-covered Type USE wire and where subjected to 90°C (194°F) and lower temperatures as insulation on CP-, Thermoset CPE-, NBR/PVC, XL-, or neoprene-jacketed or fibrous-covered Type USE-2 wire.

Table 50.193
Physical properties of Class 2 60°C (140°F) SBR/NR[a] insulation
Table deleted

Table 50.194
Physical properties of Class 3 60°C (140°F) SBR/NR[a] insulation
Table deleted

Table 50.195
Physical properties of Class 4 60°C (140°F) SBR/NR[a] insulation
Table deleted

Table 50.196
Physical properties of 60°C SBR/NR[a] insulation

Condition of specimens at time of measurement	Maximum set in recovery test (1-inch or 25-mm bench marks stretched to 3 inches or 75 mm)	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	19 percent (3/16 inch or 4.8 mm)	300 percent (3 inches or 75 mm)	1500 lbf/in^2 or 10.3 MPa
Aged in a full-draft circulating-air oven for 168 h at 70.0 ±1.0°C (158.0 ±1.8°F)	Not measured	65 percent of the result with unaged specimens where the sum of tensile plus elongation percentages is at least 140 percent. Otherwise, 70 percent of the result with unaged specimens.	

[a] SBR/NR designates a thermoset compound whose characteristic constituent is SBR, NR (natural rubber), or a blend of the two.

Table 50.197
Physical properties of Class 7 75°C (167°F) SBR/NR[a] insulation
Table deleted

Table 50.198
Physical properties of 75°C SBR/NR[a] insulation

Condition of specimens at time of measurement	Maximum set in recovery test (1-inch or 25-mm bench marks stretched to 2-1/2 inches or 62.5 mm)	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	25 percent (1/4 inch or 6.2 mm)	250 percent (2-1/2 inches or 62.5 mm)	600 lbf/in^2 or 4.14 MPa
Aged in a full-draft circulating-air oven for 240 h at 100.0 ±1.0°C (212.0 ±1.8°F)	Not measured	50 percent of the result with unaged specimens	70 percent of the result with unaged specimens

[a] SBR/NR designates a thermoset compound whose characteristic constituent is SBR, NR (natural rubber), or a blend of the two.