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INSULATION AND JACKET MATERIALS

40 General

40.1 The chemical composition of an insulating or jacketing material is not specified.

40.2 The methods of preparation of samples, of selection and conditioning of specimens, and of making the measurements and calculations for ultimate elongation and tensile strength are indicated under the heading Physical Properties Tests of Insulation and Jacket in this standard (see Sections 400 – 481).

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47 Index Table

47.1 Table 47.1 is an index to all of the materials that are for use as insulation and jackets in the various types of wire, cable, and flexible cord. The materials are grouped alphabetically by their generic designations. Physical properties requirements are given in the indicated tables(s) or paragraphs in Specific Materials, Section 50 of this standard, either for the particular insulation or jacket material from an individual type as specified in the applicable wire standard, or for the class of insulation or jacket material specified in the applicable wire standard.

47.2 Table 47.1 is an index to the location in UL 1581 of the physical properties requirements for the insulating and jacketing materials specified in the applicable wire standards for all types of wire and cable, including fixture wire, but not including decorative-lighting cords and wire, other flexible cords, elevator cable, or hoistway cable. In Table 47.1, the materials are grouped alphabetically by their generic names or letter designations, and reference is made to particular paragraphs or a particular table in Specific Materials, Section 50, for the physical properties requirements.

47.3 Requirements for the physical properties of materials used in decorative-lighting cords and wire, in other flexible cords, in elevator cable, and in hoistway cable are tabulated in the UL 62 standard (covering flexible cords) under the decimal class numbers 2.x for insulating materials and 1.x for jacketing materials. UL 62 no longer specifies UL 1581 insulating and jacketing materials; however, for use where specified for applications outside UL 62, these materials continue to be indexed in Table 47.1, with physical properties requirements tabulated in Specific Materials, Section 50.

Table 47.1
Index to insulation and jacket materials

Table 47.1 revised May 6, 2003

Material	Applicable table(s) or paragraphs in this standard
<p>CP</p> <p>Insulations and jackets from Type USE-2 and USE cable; power-limited circuit cable; cable for power-limited fire-alarm circuits; other cables; and from Type SIS, RHW-2, RHW, and RHH wires; jacket from CATV cables</p> <p>Jacket from cable for deep-well submersible water pumps</p> <p>Class 24 insulation and jacket</p> <p>Class 26 jacket</p> <p>Class 32 insulation and jacket</p> <p>Class 42 insulation and jacket</p> <p>Class 46 jacket</p>	<p>Table 50.1</p> <p>Table 50.10</p> <p>Table 50.20</p> <p>Table 50.21</p> <p>Table 50.22</p> <p>Table 50.23</p> <p>Table 50.24</p>
<p>CPE</p> <p>Thermoplastic jacket from CATV cables, power-limited circuit cable, and cable for power-limited fire-alarm circuits, and other cables</p> <p>Thermoset jacket from CATV cables, power-limited circuit cable, cable for power-limited fire-alarm circuits, Type USE and USE-2 cables, other cables, and from Type RHH and RHW-2 wires</p> <p>Thermoset jacket from CATV cables, power-limited circuit cable, cable for power-limited fire-alarm circuits, Type USE cable, other cables, and from Type RHW wires</p> <p>Jacket from cable for deep-well submersible water pumps</p> <p>Class 37 insulation</p> <p>Class 42 insulation and jacket</p> <p>Class 47 thermoset insulation and jacket</p>	<p>Table 50.28</p> <p>Table 50.29</p> <p>Table 50.30</p> <p>Table 50.31</p> <p>Table 50.32</p> <p>Table 50.23</p> <p>Table 50.33</p>
<p>ECTFE and ETFE</p> <p>ETFE insulation from Type Z and ZW wires and from 150°C Type ZF and ZFF wires and insulation and jacket from power-limited circuit cable, cable for power-limited fire-alarm circuits, and other cables; and jacket from CATV cables</p> <p>ETFE from Type ZHF wire</p>	<p>Table 50.63</p> <p>Table 50.64</p>
<p>EP</p> <p>Insulation from Types RHW-2, RHH, and RHW</p> <p>Class 28 EPDM insulation and jacket</p> <p>Class 35 insulation</p> <p>Class 44 EPDM insulation</p> <p>Class 45 insulation</p> <p>Class 46 EPDM insulation and jacket</p>	<p>Table 50.42</p> <p>Table 50.52</p> <p>Table 50.53</p> <p>Table 50.54</p> <p>Table 50.55</p> <p>Table 50.24</p>
<p>EPCV</p> <p>Insulation from Types SIS, RHW-2, RHH, and RHW</p>	<p>Table 50.62</p>

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Material	Applicable table(s) or paragraphs in this standard
FEP	
Insulation and jacket from power-limited circuit-cable, cable for power-limited fire-alarm circuits, and other cables; and insulation from Types FEP and FEPB; jacket from CATV cables	Table 50.70
Class 12A insulation	Table 50.73
FRPE (HDFRPE and LDFRPE)	
Insulation from power-limited circuit cable and cable for power-limited fire-alarm circuits; jacket from CATV cables	Table 50.133
MFA	
Insulations and jackets from appliance-wiring material	Table 50.137
NBR/PVC	
Jacket from power-limited circuit cable, cable for power-limited fire-alarm circuits, other cables, and Type RHW	Table 50.80
Jacket from CATV cables, power-limited circuit cable, cable for power-limited fire-alarm circuits, other cables, and Type RHW-2 and RHH	Table 50.83
Jacket from cable for deep-well submersible water pumps	Table 50.87
Class 23 jacket	Table 50.96
Class 25 insulation and jacket	Table 50.97
Class 41 jacket	Table 50.125
90°C (194°F) jacket from Type USE-2 and USE cables	Table 50.99
75°C (167°F) jacket from Type USE cable	Table 50.100
Class 42 insulation and jacket	Table 50.23
Class 46 insulation and jacket	Table 50.24
Neoprene	
90°C (194°F) jacket from Type USE and USE-2 cables	Table 50.99
75°C (167°F) jacket Type USE cable	Table 50.100
Jacket from Type RHW	Table 50.105
Jacket from Types RHW-2 and RHH	Table 50.108
Jacket from cable for deep-well submersible water pumps	Table 50.112
Class 13 insulation	Table 50.120
Class 14 insulation	Table 50.121
Class 15 jacket	Table 50.122
Class 16 jacket and jacket from CATV cables, power-limited circuit cable,	Table 50.123
cable for power-limited fire-alarm circuits, and other cables	Table 50.124
Class 17 insulation and jacket and jacket from CATV cables, power-limited	Table 50.124
circuit cable, cable for power-limited fire-alarm circuits, and other cables	Table 50.125
Class 41 insulation and jacket	Table 50.125
Class 46 insulation and jacket	Table 50.24

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Material	Applicable table(s) or paragraphs in this standard
PE [75°C (167°F) thermoplastic HDPE and LDPE] HDPE insulation from single-conductor Type USE cable Class 30 PE insulation (LDPE), HDPE insulation from power-limited circuit cable, LDPE insulation from power-limited circuit cable and from cable for power-limited fire-alarm circuits	Table 50.135 Table 50.136
PFA Insulation from Type PFA and PFAH wires, jacket from CATV cables, and insulation and jacket from other wires and cables	Table 50.137
PP and FRPP Insulation from power-limited circuit cable and cable for power-limited fire-alarm circuits; jacket from CATV cables	Table 50.139
PVC Insulation from Type TW Insulation from Types THWN and THW Insulation from gasoline-resistant Types TFN, TFFN, THWN-2, and THWN Insulation from Types THW-2, THWN-2, THHW, and THHN Insulation from Type TBS Class 11 insulation Class 11 insulation and jacket Class 11 jacket Class 11 insulation and jacket Class 11 jacket Jacket from cable for deep-well submersible water pumps Class 12 75°C (167°F) insulation and jacket Class 12 90°C (194°F) insulation and jacket Class 12 105°C (221°F) insulation and jacket Class 12B insulation Oil-resistant Class 12B insulation Class 43 insulation and jacket; insulation and jacket from power-limited circuit cable and cable from power-limited fire-alarm circuits, and from other cables; jacket from CATV cables Thermoplastic insulation other than PVC from Type THHN and THWN wires	Table 50.140 Table 50.145 Table 50.150 Table 50.155 Table 50.160 Table 50.165 Table 50.166 Table 50.167 Table 50.169 Table 50.172 Table 50.175 Table 50.179 Table 50.180 Table 50.181 Table 50.155 Table 50.156 Table 50.182 Table 50.144
SRPVC (semirigid PVC) Insulation and jacket from power-limited circuit cable, cable for power-limited fire-alarm circuits, and from other cables	Table 50.183
PTFE (TFE) Class 12C PTFE insulation, PTFE insulation from	Table 50.219

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Material	Applicable table(s) or paragraphs in this standard
Type TFE, PTF, and PTFE wires and PTFE (TFE) insulation from power-limited circuit cable and cable for power-limited fire-alarm circuits	
PVDF and PVDF copolymer	
Jackets from CATV cables and insulation and jacket from power-limited circuit cable and cable for power-limited fire-alarm circuits	Table 50.185
Rubber	
SBR/IIR/NR insulation from Types RHW-2, RHH, and RHW	Table 50.189
Class 2 insulation	Table 50.193
Class 3 insulation	Table 50.194
Class 4 insulation	Table 50.195
Class 6 jacket	Table 50.196
Class 7 insulation	Table 50.197
Class 8 insulation	Table 50.198
Class 10 insulation	Table 50.199
Class 40 SBR/NR insulation	Table 50.200
Class 44 SBR/NR insulation	Table 50.54
Class 46 SBR/NR insulation and jacket	Table 50.24
SBR/IIR/NR – see "Rubber"	
Silicone rubber	
Insulation from Type SA	Table 50.205
Insulation from jacketed/fibrous-covered Type RHH wire	Table 50.206
Class 22 insulation and insulation from power-limited circuit cable, cable for power-limited fire-alarm circuits, from other cables, and jackets for CATV cables	Table 50.210
TFE	
Class 12C PTFE insulation and PTFE insulation from power-limited circuit cable, from cable for power-limited fire-alarm circuits, from other cables, and from Type TFE wire	Table 50.219
THV	
80°C (176°F) jackets from appliance-wiring material	Table 50.221
TPE	
105°C (221°F) insulation and jacket from power-limited circuit cable and from cable for power-limited fire-alarm circuits, and from other cables; and 105°C (221°F) Class 36 insulation and jacket, and 105°C (221°F) jacket from CATV cables	Table 50.223
90°C (194°F) insulation and jacket from power-limited circuit cable and from cable for power-limited fire-alarm circuits, and from other cables; and 90°C (194°F) Class 36 insulation and jacket; 90°C (194°F) jacket from CATV cables	Table 50.224

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Material	Applicable table(s) or paragraphs in this standard
TPES Insulations and jackets from appliance-wiring material	Table 50.226
TPU Insulations and jackets from appliance-wiring material	Table 50.227
XL 90°C (194°F) jacket from Type USE-2 and USE cables 75°C (167°F) jacket from Type USE cable Jacket from cable for deep-well submersible water pumps XL insulation from Type RFHH-2, RFHH-3, XHHW-2, XHHW, SIS, RHH, RHW-2, and RHW and power-limited circuit cable, cable for power-limited fire-alarm circuits, and other cables; jackets from CATV cables	Table 50.228 Table 50.229 Table 50.230 Table 50.231
Class 29 [90°C (194°F)] Class 31 [75°C (167°F)] Class 33 [105°C (221°F)]	Table 50.237 Table 50.241 Table 50.245
XLPO insulation 125°C (257°F) insulation Class 38 [150°C (302°F)] insulation 105°C (221°F) insulation or jacket from power-limited circuit-cable, cable for power-limited fire-alarm circuits, and other cables	Table 50.232 Table 50.232 Table 50.233

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50 Specific Materials

Table 50.1

Physical properties of 90°C (194°F) and 75°C (167°F) CP^a jackets from CATV cables and insulations and jackets from Type USE and USE-2 cables; power-limited circuit cable; cable for power-limited fire-alarm circuits; other cables; and Type RHW-2, RHH, RH, and SIS wires

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	200 percent	1500 lbf/in ² or 10.3 MPa (MN/m ²) or 1034 N/cm ² or 1.05 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h: At 121.0 ±1.0°C (249.8 ±1.8°F) for specimens of 90°C (194°F) insulation or jacket from power-limited circuit cable, Type USE-2 cable, or from Type RHW-2, RHH, and SIS wires	50 percent of the result with unaged specimens	85 percent of the result with unaged specimens

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Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
At 113.0 ±1.0°C (235.4 ±1.8°F) for specimens of 75°C (167°F) insulation or jacket from power-limited circuit cable, cable for power-limited fire-alarm circuits, or from Type RHW and RH wires, or Type USE cable	50 percent of the result with unaged specimens	85 percent of the result with unaged specimens
Aged in oil for 18 h at 121.0 ±1.0°C (249.8 ±1.8°F)	60 percent of the result with unaged specimens	60 percent of the result with unaged specimens

^a CP designates a thermoset compound whose characteristic constituent is chlorosulfonated polyethylene. CP rated 90°C (194°F) is for use as conductor insulation on Type RHW-2, RHH, and SIS wires without any covering over the insulation. CP rated 75°C (167°F) is for use as conductor insulation on Type RHW and RH wires without any covering over the insulation.

Table 50.10
Physical properties of CP^a jacket from cable for deep-well submersible water pumps

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	25 percent (1/4 inch or 6.2 mm)	300 percent (3 inches or 75 mm)	1500 lbf/in ² or 10.3 MPa (MN/m ²) or 1034 N/cm ² or 1.05 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h at 70.0 ±1.0°C (158.0 ±1.8°F)	Not measured	70 percent of the result with unaged specimens	70 percent of the result with unaged specimens
Aged in oil for 18 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 CP designates a thermoset compound whose characteristic constituent is chlorosulfonated polyethylene.

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Table 50.20
Physical properties of Class 24 90°C (194°F) CP^a insulation and jacket

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	200 percent (2 inches or 50 mm)	1200 lbf/in ² or 8.27 MPa (MN/m ²) or 827 N/cm ² or 0.844 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h at 121.0 ±1.0°C (249.8 ±1.8°F)	100 percent (1 inch or 25 mm)	1200 lbf/in ² or 8.27 MPa (MN/m ²) or 827 N/cm ² or 0.844 kgf/mm ²
60°C (140°F) oil-resistant insulation or jacket: Aged in oil for 18 h at 121 ±1.0°C (249.8 ±1.8°F)	60 percent of the result with unaged specimens	60 percent of the result with unaged specimens

^a Class 24 CP designates a thermoset compound whose characteristic constituent is chlorosulfonated polyethylene.

Table 50.21
Physical properties of Class 26 60°C (140°F) CP^a jacket

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	25 percent (1/4 inch or 6.2 mm)	300 percent (3 inches or 75 mm)	1500 lbf/in ² or 10.2 MPa (MN/m ²) or 1034 N/cm ² or 1.05 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h at 70.0 ±1.0°C (158.0 ±1.8°F)	Not measured	70 percent of the result with unaged specimens	70 percent of the result with unaged specimens
60°C (140°F) oil-resistant jacket: Aged in oil for 18 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 Class 26 CP designates a thermoset compound whose characteristic constituent is chlorosulfonated polyethylene.

Table 50.22
Physical properties of Class 32 105°C (221°F) CP^a insulation and jacket

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	200 percent (2 inches or 50 mm)	1200 lbf/in ² or 8.27 MPa (MN/m ²) or 827 N/cm ² or 0.844 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h at 136.0 ±1.0°C (276.8 ±1.8°F)	100 percent (1 inch or 25 mm)	1200 lbf/in ² or 8.27 MPa (MN/m ²) or 827 N/cm ² or 0.844 kgf/mm ²
60°C (140°F) oil-resistant insulation or jacket: Aged in oil for 18 h at 121.0 ±1.0°C (249.8 ±1.8°F)	60 percent of the result with unaged specimens	60 percent of the result with unaged specimens

^a Class 32 CP designates a thermoset compound whose characteristic constituent is chlorosulfonated polyethylene.

Table 50.23
Physical properties of Class 42 90°C (194°F) CP^a, CPE^b, and NBR/PVC^c insulations and jacket

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	200 percent (2 inches or 50 mm)	1200 lbf/in ² or 8.27 MPa (MN/m ²) or 827 N/cm ² or 0.844 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h at 121.0 ±1.0°C (249.8 ±1.8°F)	100 percent (1 inch or 25 mm)	1200 lbf/in ² or 8.27 MPa (MN/m ²) or 827 N/cm ² or 0.844 kgf/mm ²
60°C (140°F) oil-resistant insulation or jacket: Aged in oil for 18 h at 121.0 ±1.0°C (249.8 ±1.8°F)	60 percent of the result with unaged specimens	60 percent of the result with unaged specimens

^a Class 42 CP designates a thermoset compound whose characteristic constituent is chlorosulfonated polyethylene.
^b Class 42 CPE designates a thermoset compound whose characteristic constituent is chlorinated polyethylene.
^c Class 42 NBR/PVC designates a thermoset compound whose characteristic constituents are acrylonitrile butadiene rubber and polyvinyl chloride.

Table 50.24
**Physical properties of Class 46 60°C (140°F) and 75°C (167°F) CP^a, EPDM^b, NBR/PVC^c,
 neoprene^d, and SBR/NR^e insulations and jackets**

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)		Minimum tensile strength	
	60°C (140°F) compound	75°C (167°F) compound	60°C (140°F) compound	75°C (167°F) compound
Unaged	200 percent (2 inches or 50 mm)		1500 lbf/in ² or 10.3 MPa (MN/m ²) or 1034 N/cm ² or 1.05 kgf/mm ²	
Aged in a full-draft circulating-air oven for 168 h at 70.0 ±1.0°C (158.0 ±1.8°F)	65 percent of the result with unaged specimens where the sum of the tensile and elongation percentages is at least 140. Otherwise, 70 percent of the result with unaged specimens	Not measured	65 percent of the result with unaged specimens where the sum of the tensile and elongation percentages is at least 140. Otherwise, 70 percent of the result with unaged specimens	Not measured
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	Not measured	70 percent of the result with unaged specimens
60°C (140°F) oil-resistant jacket: Aged in oil for 18 h at 121.0 ±1.0°C (249.8 ±1.8°F)	60 percent of the result with unaged specimens			

^a Class 46 CP designates a thermoset compound whose characteristic constituent is chlorosulfonated polyethylene.
^b Class 46 EPDM designates a thermoset compound whose characteristic constituent is a terpolymer of ethylene, propylene, and small amount of nonconjugated diene.
^c Class 46 NBR/PVC designates a thermoset compound whose characteristic constituents are acrylonitrile butadiene rubber and polyvinyl chloride.
^d Class 46 neoprene designates a thermoset compound whose characteristic constituent is polychloroprene.
^e Class 46 SBR/NR designates a thermoset compound whose characteristic constituent is SBR, NR (natural rubber), or a blend of the two.

Table 50.28

Physical properties of 90°C (194°F) thermoplastic CPE^a jacket from CATV cables, power-limited circuit cable, cable for power-limited fire-alarm circuits, and other cables

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 38 mm)	1400 lbf/in ² or 9.65 MPa (MN/m ²) or 965 N/cm ² or 0.984 kgf/mm ²
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

^a CPE designates a thermoplastic compound whose characteristic constituent is chlorinated polyethylene.

Table 50.29

Physical properties of 90°C (194°F) thermoset CPE^a jacket from CATV cables, power-limited circuit cable, cable for power-limited fire-alarm circuits, Type USE-2 cables, other cables, and Type RHW-2 and RHH wires

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	250 percent (2-1/2 inches or 62.5 mm)	1500 lbf/in ² or 10.3 MPa (MN/m ²) or 1034 N/cm ² or 1.05 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h at 121.0 ±1.0°C (249.8 ±1.8°F)	60 percent of the result with unaged specimens	85 percent of the result with unaged specimens
Aged in oil for 18 h at 121.0 ±1.0°C (249.8 ±1.8°F)	60 percent of the result with unaged specimens	60 percent of the result with unaged specimens

^a Thermoset CPE designates a thermoset compound whose characteristic constituent is chlorinated polyethylene.

Table 50.30

Physical properties of 75°C (167°F) thermoset CPE^a jacket from CATV cables, power-limited circuit cable, cable for power-limited fire-alarm circuits, Type USE cable, other cables, and Type RHW and RH wires

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	200 percent (2-1/2 inches or 62.5 mm)	1500 lbf/in ² or 10.3 MPa (MN/m ²) or 1034 N/cm ² or 1.05 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h at 113.0 ±1.0°C (235.4 ±1.8°F)	60 percent of the result with unaged specimens	85 percent of the result with unaged specimens

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Table 50.30 Continued

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Aged in oil for 18 h at 121.0 ±1.0°C (249.8 ±1.8°F)	60 percent of the result with unaged specimens	60 percent of the result with unaged specimens
^a Thermoset CPE is described in note ^a to Table 50.29.		

Table 50.31

Physical properties of thermoset CPE^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	200 percent (2-1/2 inches or 62.5 mm)	1500 lbf/in ² or 10.3 MPa (MN/m ²) or 1034 N/cm ² or 1.05 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h at 113.0 ±1.0°C (235.4 ±1.8°F)	60 percent of the result with unaged specimens	85 percent of the result with unaged specimens
Aged in oil for 18 h at 121.0 ±1.0°C (249.8 ±1.8°F)	60 percent of the result with unaged specimens	60 percent of the result with unaged specimens
^a Thermoset CPE is described in note ^a to Table 50.29.		

Table 50.32

Physical properties of Class 37 90°C (194°F) thermoset CPE^a insulation

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	200 percent (2 inches or 50 mm)	1200 lbf/in ² or 8.27 MPa (MN/m ²) or 827 N/cm ² or 0.844 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h at 121.0 ±1.0°C (249.8 ±1.8°F)	100 percent (1 inch or 25 mm)	1200 lbf/in ² or 8.27 MPa (MN/m ²) or 827 N/cm ² or 0.844 kgf/mm ²
60°C (140°F) oil-resistant insulation or jacket: Aged in oil for 18 h at 121.0 ±1.0°C (249.8 ±1.8°F)	60 percent of the result with unaged specimens	60 percent of the result with unaged specimens
^a Class 37 thermoset CPE designates a thermoset compound whose characteristic constituent is chlorinated polyethylene.		

Table 50.33
Physical properties of Class 47 105°C (221°F) thermoset CPE^a insulation and jacket

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	250 percent (2-1/2 inches or 62.5 mm)	1200 lbf/in ² or 8.27 MPa (MN/m ²) or 827 N/cm ² or 0.844 kgf/mm ²
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	80 percent of the result with unaged specimens
60°C (140°F) oil-resistant jacket: Aged in oil for 18 h at 121.0 ±1.0°C (249.8 ±1.8°F)	60 percent of the result with unaged specimens	60 percent of the result with unaged specimens

^a Class 47 thermoset CPE designates a thermoset compound whose characteristic constituent is chlorinated polyethylene.

Table 50.34
Physical properties of 90°C (194°F) and 75°C (167°F) thermoset CPE^a insulations from Type USE and USE-2 cables and Type RHW-2, RHW, RHH, and SIS wires

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	200 percent	1500 lbf/in ² or 10.3 MPa (MN/m ²) or 1034 N/cm ² or 1.05 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h: At 121.0 ±1.0°C (249.8 ±1.8°F) for specimens of 90°C (194°F) insulation or jacket from power-limited circuit cable, Type USE-2 cable, or from Type RHW-2, RHH, and SIS wires	50 percent of the result with unaged specimens	85 percent of the result with unaged specimens
At 113.0 ±1.0°C (235.4 ±1.8°F) for specimens of 75°C (167°F) insulation or jacket from power-limited circuit cable, cable for power-limited fire-alarm circuits, or from Type RHW wire, or Type USE cable	50 percent of the result with unaged specimens	85 percent of the result with unaged specimens
Aged in oil for 18 h at 121.0 ±1.0°C (249.8 ±1.8°F)	60 percent of the result with unaged specimens	60 percent of the result with unaged specimens

^a Thermoset CPE designates a thermoset compound whose characteristic constituent is chlorinated polyethylene. Thermoset CPE rated 90°C (194°F) is for use as conductor insulation on Type RHW-2, RHH, and SIS wires without any covering over the insulation. Thermoset CPE rated 75°C (167°F) is for use as conductor insulation on Type RHW wire without any covering over the insulation.

Table 50.42
Physical properties of EP^a insulation from Type RHW-2, RH, RHW, and RHH wires

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	250 percent (2-1/2 inches or 50 mm)	700 lbf/in ² or 4.83 MPa (MN/m ²) or 483 N/cm ² or 0.492 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h at 121.0 ±1.0°C (249.8 ±1.8°F)	75 percent of the result with unaged specimens	75 percent of the result with unaged specimens

^a EP designates a thermoset compound whose characteristic constituent is a copolymer (EPM) of ethylene and propylene; a terpolymer (EDPM) of ethylene, propylene, and a small amount of nonconjugated diene; or a blend of EPM and EPDM. EP is for use where subjected to 75°C (167°F) and lower temperatures as insulation under a CP, NBR/PVC, or neoprene jacket or a fibrous covering on Type RH wire; where subjected to 90°C (194°F) and lower temperatures as insulation under a CP, NBR/PVC, or neoprene jacket or a fibrous covering on Type RHH and RHW-2 wires or as the underlayer of composite insulation consisting of CP over EP without a covering over the CP on Type RHH wire; and where subjected to 75°C (167°F) and lower temperatures as insulation under a CP, NBR/PVC, or neoprene jacket or a fibrous covering on Type RHW wire.

Table 50.52
Physical properties of Class 28 75°C (167°F) and 90°C (194°F) EPDM^a insulations and jackets

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)			Minimum tensile strength		
	Insulation		Jacket	Insulation		Jacket
	75°C (167°F)	90°C (194°F)	75°C (167°F)	75°C (167°F)	90°C (194°F)	75°C (167°F)
Unaged	250 percent (2-1/2 inches or 62.5 mm)	250 percent (2-1/2 inches or 62.5 mm)	300 percent (3 inches or 75 mm)	700 lbf/in ² or 4.83 MPa (MN/m ²) or 483 N/cm ² or 0.492 kgf/mm ²	700 lbf/in ² or 4.83 MPa (MN/m ²) or 483 N/cm ² or 0.492 kgf/mm ²	1500 lbf/in ² or 10.3 MPa (MN/m ²) or 1034 N/cm ² or 1.05 kgf/mm ²
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	Not measured	50 percent of the result with unaged specimens	70 percent of the result with unaged specimens	Not measured	70 percent of the result with unaged specimens
Aged in a full-draft circulating-air oven for 240 h at 121.0 ±1.0°C (249.8 ±1.8°F)	Not measured	50 percent of the with unaged specimens	Not measured	Not measured	50 percent of the result with unaged specimens	Not measured

^a Class 28 EPDM designates a thermoset compound whose characteristic constituent is a terpolymer of ethylene, propylene, and a small amount of nonconjugated diene.

Table 50.53
Physical properties of Class 35 105°C (221°F) EP^a insulation

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	250 percent (2-1/2 inches or 62.5 mm)	700 lbf/in ² or 4.83 MPa (MN/m ²) or 483 N/cm ² or 0.492 kgf/mm ²
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	50 percent of the result with unaged specimens
^a Class 35 EP designates a thermoset compound whose characteristic constituent is a copolymer (EPM) of ethylene and propylene; a terpolymer (EPDM) of ethylene, propylene, and a small amount of nonconjugated diene; or a blend of EPM and EPDM.		

Table 50.54
Physical properties of Class 44 75°C (167°F) EPDM^a and SBR/NR^b insulations and jackets

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	250 percent (2-1/2 inches or 62.5 mm)	600 lbf/in ² or 4.14 MPa (MN/m ²) or 414 N/cm ² or 0.422 kgf/mm ²
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	70 percent of the result with unaged specimens
^a Class 44 EPDM designates a thermoset compound whose characteristic constituent is a terpolymer of ethylene, propylene, and a small amount of nonconjugated diene. ^b Class 44 SBR/NR designates a thermoset compound whose characteristic constituent is SBR, NR (natural rubber), or a blend of the two.		

Table 50.55
Physical properties of Class 45 90°C (194°F) and 105°C (221°F) EP^a insulations

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	200 percent (2 inches or 50 mm)	700 lbf/in ² or 4.83 MPa (MN/m ²) or 483 N/cm ² or 0.492 kgf/mm ²
Aged in a full-draft circulating-air oven for the specified time at the specified temperature ^b	50 percent of the result with unaged specimens	50 percent of the result with unaged specimens
60°C (140°F) oil-resistant insulation: Aged in oil for 18 h at 121.0 ±1.0°C (249.8 ±1.8°F)	60 percent of the result with unaged specimens	60 percent of the result with unaged specimens

Table 50.55 Continued

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength											
<p>^a Class 45 EP designates a thermoset compound whose characteristic constituent is a copolymer (EPM) of ethylene and propylene; a terpolymer (EPDM) of ethylene, propylene, and a small amount of nonconjugated diene; or a blend of EPM and EPDM.</p> <p>^b The oven time and temperature are to be as follows:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2">Temperature rating of insulation</th> <th colspan="2">Specified oven time and temperature</th> </tr> <tr> <th>h</th> <th>Temperature</th> </tr> </thead> <tbody> <tr> <td>90°C (194°F)</td> <td>240</td> <td>121.0 ±1.0°C (294.8 ±1.8°F)</td> </tr> <tr> <td>105°C (221°F)</td> <td>168</td> <td>136.0 ±1.0°C (276.8 ±1.8°F)</td> </tr> </tbody> </table>			Temperature rating of insulation	Specified oven time and temperature		h	Temperature	90°C (194°F)	240	121.0 ±1.0°C (294.8 ±1.8°F)	105°C (221°F)	168	136.0 ±1.0°C (276.8 ±1.8°F)
Temperature rating of insulation	Specified oven time and temperature												
	h	Temperature											
90°C (194°F)	240	121.0 ±1.0°C (294.8 ±1.8°F)											
105°C (221°F)	168	136.0 ±1.0°C (276.8 ±1.8°F)											

Table 50.62
Physical properties of EPCV^a insulation from Type RHW-2, RH, RHW, RHH, and SIS wires

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)	Minimum tensile strength
Unaged	225 percent (2-1/4 inches or 56.2 mm)	1200 lbf/in ² or 8.27 MPa (MN/m ²) or 827 N/cm ² or 0.844 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h at 121.0 ±1.0°C (249.8 ±1.8°F)	75 percent of the result with unaged specimens	75 percent of the result with unaged specimens

^a EPCV designates a thermoset compound whose characteristic constituent is a covulcanizate of ethylene and propylene (EP) with a polyethylene (PE). EPCV is for use where subjected to 75°C (167°F) and lower temperatures as insulation on Type RH and RHW wires without any outer covering and where subjected to 90°C (194°F) and lower temperatures as insulation on Type RHW-2, RHH, and SIS wires without any covering over the insulation.

Table 50.63
Physical properties of ETFE^a insulation from Type Z and ZW wires and from 150°C (302°F) Type ZF and ZFF wires; ECTFE^a and ETFE^a insulation or jacket from power-limited circuit cable, cable for power-limited fire-alarm circuits, and other cables; and ECTFE^a and ETFE^a jackets from CATV cables

Table 50.63 revised May 6, 2003

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks) ^{b,c}	Minimum tensile strength ^{b,c}
Unaged	100 percent (1 inch or 25 mm)	5000 lbf/in ² or 34.5 MPa (MN/m ²) or 3447 N/cm ² or 3.52 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h at 180.0 ±1.0°C (356.0 ±1.8°F)	75 percent of the result with unaged specimens	85 percent of the result with unaged specimens or 5000 lbf/in ² or 34.5 MN/m ² or 3447 N/cm ² or

Table 50.63 Continued

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks) ^{b,c}	Minimum tensile strength ^{b,c}
		3.52 kgf/mm ²

^a ECTFE and ETFE designate thermoplastic materials whose characteristic constituent is either a copolymer of ethylene and tetrafluoroethylene (ETFE) or a copolymer of ethylene and chlorotrifluoroethylene (ECTFE). The material is uncompounded ECTFE or ETFE to which a small amount of pigment, lubricant, or both, is or is not added.

^b ECTFE and ETFE are to be tested at a speed of 2.0 ±0.2 in/min or 50 ±5 mm/min.

^c With band-marking inks in place or removed prior to the aging of specimens.

Table 50.64
Physical properties of 200°C (382°F) ETFE^a insulation

Table 50.64 added October 31, 2001

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks) ^{b,c}	Minimum tensile strength
Unaged	200 percent (2 inches or 50 mm)	2000 lbf/in ² or 13.79 MPa (MN/m ²) or 1379 N/cm ² or 1.41 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h at 232.0 ±2.0°C (449.6 ±3.6°F)	85 percent of the result with unaged specimens	80 percent of the result with unaged specimens

^a ETFE designates a thermoplastic material whose characteristic constituent is a copolymer of ethylene and tetrafluoroethylene. The material is uncompounded ETFE to which a small amount of pigment, lubricant, or both, is or is not added.

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

^c With band-marking inks in place or removed prior to the aging of specimens.

Table 50.70
Physical properties of 200°C (392°F) FEP^a jacket from CATV cables, jacket or insulation from power-limited circuit cable, from cable for power-limited fire-alarm circuits, or other cables; and insulation from Type FEP and FEPB wires

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks) ^b	Minimum tensile strength ^b
Unaged	200 percent (2 inches or 50 mm)	2500 lbf/in ² or 17.2 MPa (MN/m ²) or 1724 N/cm ² or 1.76 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h at 232.0 ±1.0°C (449.6 ±1.8°F)	75 percent of the result with unaged specimens	75 percent of the result with unaged specimens

^a FEP designates a thermoplastic material whose characteristic constituent is a copolymer of tetrafluoroethylene and hexafluoropropylene. The material is uncompounded FEP to which it is appropriate to add a small amount of pigment, lubricant, or both.

^b FEP is to be tested at a speed of 20 ±1 in/min or 500 ±25 mm/min.

Table 50.73
Physical properties of Class 12A FEP^a insulation

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks) ^b	Minimum tensile strength
Unaged	200 percent (2 inches or 50 mm)	2500 lbf/in ² or 17.2 MPa (MN/m ²) or 1724 N/cm ² or 1.76 kgf/mm ²
Aged in a full-draft circulating-air oven for 96 h at 232.0 ±1.0°C (449.6 ±1.8°F)	75 percent of the result with unaged specimens	75 percent of the result with unaged specimens
^a FEP designates a thermoplastic material whose characteristic constituent is a copolymer of tetrafluoroethylene and hexafluoropropylene. The material is uncompounded FEP to which it is appropriate to add a small amount of pigment, lubricant, or both. ^b FEP is to be tested at a speed of 20 ±1 in/min or 500 ±25 mm/min.		

Table 50.80
Physical properties of 75°C (167°F) NBR/PVC^a thermoset jacket from power-limited circuit cable, cable for power-limited fire-alarm circuits, other cables, and Type RH and RHW wires

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm Bench Marks)	Minimum tensile strength
Unaged	200 percent (2 inches or 50 mm)	1500 lbf/in ^a or 10.3 MPa (MN/m ^a) or 1034 N/cm ^a or 1.05 kgf/mm ^a
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	70 percent of the result with unaged specimens
Aged in oil for 18 h at 121.0 ±1.0°C (249.8±1.8°F)	60 percent of the result with unaged specimens	60 percent of the result with unaged specimens
^a NBR/PVC designates a thermoset compound whose characteristic constituents are acrylonitrile butadiene rubber and polyvinyl chloride.		

Table 50.83

Physical properties of 90°C (194°F) NBR/PVC^a thermoset jacket from CATV cables, power-limited circuit cable, cables for power-limited fire-alarm circuits, other cables, and Type RHW-2 and RHH wires

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	31.25 percent (5/16 inch or 7.8 mm)	250 percent (2-1/2 inches or 62.5 mm)	1200 lbf/in ² or 8.27 MPa (MN/m ²) or 827 N/cm ² or 0.844 kgf/mm ²
Aged in a full-draft circulating air oven for 240 h at 121.0 ±1.0°C (249.8±1.8°F)	Not measured	50 percent (1/2 inch or 12.5 mm)	900 lbf/in ² or 6.21 MPa (MN/m ²) or 621 N/cm ² or 0.633 kgf/mm ²
Aged in oil for 18 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 NBR/PVC designates a thermoset compound whose characteristic constituents are acrylonitrile butadiene rubber and polyvinyl chloride.

Table 50.87

Physical properties of NBR/PVC^a thermoset jacket from cable for deep-well submersible water pumps

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	31 percent (5/16 inch or 7.8 mm)	300 percent (3 inches or 75 mm)	1500 lbf/in ² or 10.3 MPa (MN/m ²) or 1034 N/cm ² or 1.05 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h at 70.0 ±1.0°C (158.0 ±1.8°F)	Not measured	70 percent of the result with unaged specimens	70 percent of the result with unaged specimens
Aged in oil for 18 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 NBR/PVC thermoset is described in note ^a to Table 50.83.

Table 50.96
Physical properties of Class 23 60°C (140°F) NBR/PVC^a thermoset jacket

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
	31 percent (5/16 inch or 7.8 mm)	Not measured		
Unaged	31 percent (5/16 inch or 7.8 mm)	Not measured	300 percent (3 inches or 75 mm)	Jackets from 8 AWG and larger Type SO cables: 1800 lbf/in ² or 12.4 MPa (MN/m ²) or 1240 N/cm ² or 1.27 kgf/mm ² Other jackets: 1500 lbf/in ² or 10.3 MPa (MN/m ²) or 1034 N/cm ² or 1.05 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h at 70.0 ±1.0°C (158.0 ±1.8°F)	Not measured	Not measured	70 percent of the result with unaged specimens	70 percent of the result with unaged specimens
60°C (140°F) oil-resistant jacket: Aged in oil for 18 h at 121.0 ±1.0°C (249.8 ±1.8°F)	Not measured	Not measured	60 percent of the result with unaged specimens	60 percent of the result with unaged specimens

^a Class 23 NBR/PVC designates a thermoset compound whose characteristic constituents are acrylonitrile butadiene rubber and polyvinyl chloride.

Table 50.97
Physical properties of Class 25 90°C (194°F) and 75°C (167°F) NBR/PVC^a thermoset insulations and jackets

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)		Minimum tensile strength	
	75°C (167°F) compound	90°C (194°F) compound	75°C (167°F) compound	90°C (194°F) compound
Unaged	200 percent (2 inches or 50 mm)		1500 lbf/in ² or 10.3 MPa (MN/m ²) or 1034 N/cm ² or 1.05 kgf/mm ²	
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	Not measured	70 percent of the result with unaged specimens	Not measured
Aged in a full-draft circulating air oven for 168 h at	Not measured	100 percent (1 inch or 25 mm)	Not measured	1200 lbf/in ² or 8.27 MPa (MN/m ²) or

Table 50.97 Continued on Next Page

Table 50.97 Continued

Condition of specimens at time of measurement	Minimum ultimate elongation (1-inch or 25-mm bench marks)		Minimum tensile strength	
	75°C (167°F) compound	90°C (194°F) compound	75°C (167°F) compound	90°C (194°F) compound
121.0 ±1.0°C (249.8 ±1.8°F) 60°C (140°F) oil-resistant insulation or jacket: Aged in oil for 18 h at 121.0 ±1.0°C (249.8 ±1.8°F)	60 percent of the result with unaged specimens		60 percent of the result with unaged specimens	827 N/cm ² or 0.844 kgf/mm ²
^a Class 25 NBR/PVC designates a thermoset compound whose characteristic constituents are acrylonitrile butadiene rubber and polyvinyl chloride.				

Table 50.98
Physical properties of Class 27 90°C (194°F) NBR/PVC^a thermoset jacket

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	31.25 percent (5/16 inch or 7.8 mm)	250 percent (2-1/2 inches or 62.5 mm)	1200 lbf/in ² or 8.27 MPa (MN/m ²) or 827 N/cm ² or 0.844 kgf/mm ²
Aged in a full-draft circulating-air oven for 240 h at 121.0 ±1.0°C (249.8 ±1.8°F)	Not measured	50 percent (1/2 inch or 12.5 mm)	900 lbf/in ² or 6.21 MPa (MN/m ²) or 621 N/cm ² or 0.633 kgf/mm ²
60°C (140°F) oil-resistant jacket: Aged in oil for 18 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 Class 27 NBR/PVC designates a thermoset compound whose characteristic constituents are acrylonitrile butadiene rubber and polyvinyl chloride.			

Table 50.99
Physical properties of 90°C (194°F) neoprene^a and NBR/PVC^b jackets from Type USE-2 and USE cables

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)	1800 lbf/in ² or 12.4 MPa (MN/m ²) or 1240 N/cm ² or 1.27 kgf/mm ²
Aged in a full-draft circulating-air oven for 240 h at 121.0 ±1.0°C (249.8 ±1.8°F)	Not measured	50 percent (1/2 inch or 12.5 mm)	900 lbf/in ² or 6.2 MPa (MN/m ²) or 621 N/cm ² or 0.633 kgf/mm ²
Aged in oil for 18 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 Neoprene designates a thermoset compound whose characteristic constituent is polychloroprene.
^b NBR/PVC designates a thermoset compound whose characteristic constituents are acrylonitrile butadiene rubber and polyvinyl chloride.

Table 50.100
Physical properties of 75°C (167°F) neoprene^a or NBR/PVC^b jacket from Type USE cable

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)	1800 lbf/in ² or 12.4 MPa (MN/m ²) or 1240 N/cm ² or 1.27 kgf/mm ²
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
Aged in oil for 18 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 Neoprene designates a thermoset compound whose characteristic constituent is polychloroprene.
^b NBR/PVC designates a thermoset compound whose characteristic constituents are acrylonitrile butadiene rubber and polyvinyl chloride.

Table 50.105
Physical properties of neoprene^a jacket from Type RH and RHW wires

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)	Jackets 15 mils or 0.38 mm thick: 1500 lbf/in ² or 10.3 MPa (MN/m ²) or 1034 N/cm ² or 1.05 kgf/mm ² Thicker jacket: 1800 lbf/in ² or 12.4 MPa (MN/m ²) or 1240 N/cm ² or 1.27 kgf/mm ²
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
Aged in oil for 18 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 Neoprene designates a thermoset compound whose characteristic constituent is polychloroprene. Neoprene is for use where subjected to 75°C (167°F) and lower temperatures as a jacket on Type RH or RHW wire insulated with SBR/IIR/NR rubber or EP thermoset.			

Table 50.108
Physical properties of neoprene^a jacket from Type RHW-2 and RHH wires

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)	Jacket 15 mils or 0.38 mm thick: 1500 lbf/in ² or 10.3 MPa (MN/m ²) or 1034 N/cm ² or 1.05 kgf/mm ² Thicker jacket: 1800 lbf/in ² or 12.4 MPa (MN/m ²) or 1240 N/cm ² or 1.27 kgf/mm ²
Aged in a full-draft circulating-air for 240 h at 121.0 ±1.0°C (249.8 ±1.8°F)	Not measured	50 percent (1/2 inch or 12.5 mm)	900 lbf/in ² or 6.2 MPa (MN/m ²) or 621 N/cm ² or 0.633 kgf/mm ²
Aged in oil for 18 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

Table 50.108 Continued on Next Page

Table 50.108 Continued

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
^a Neoprene designates a thermoset compound whose characteristic constituent is polychloroprene. Neoprene is for use where subjected to 90°C (194°F) and lower temperatures as a jacket on Type RHH and RHW-2 wires insulated with SBR/IIR/NR rubber or EP thermoset.			

Table 50.112

Physical properties of neoprene^a jacket from cable for deep-well submersible water pumps

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 (MN/m ²) or 1034 N/cm ² or 1.05 kgf/mm ²
Aged in a full-draft circulating-air oven for 168 h at 70.0 ±1.0°C (158.0 ±1.8°F)	Not measured	70 percent of the result with unaged specimens	70 percent of the result with unaged specimens
Aged in oil for 18 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 Neoprene thermoset is described in note ^a to Table 50.120.			

Table 50.120

Physical properties of Class 13 60°C (140°F) neoprene^a insulation

Conditions 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)	250 percent (2-1/2 inches or 62.5 mm)	1200 lbf/in ² or 8.27 MPa (MN/m ²) or 827 N/cm ² or 0.844 kgf/mm ²
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	75 percent of the result with unaged specimens
60°C (140°F) oil-resistant insulation Aged in oil for 18 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 Class 13 neoprene designates a thermoset compound whose characteristic constituent is polychloroprene.			