	509–1015	(1001-2000)	2.41	(0.095)	2.41	(0.095)	2.79	(0.110)	—		—		—	

NOTE—Minimum point is 90% of minimum average.

[a] Where specifically listed by an NRTL, Composite Insulation consisting of silicone rubber with a crosslinked polyolefin outer covering in accordance with Table 15 of UL-44 is acceptable.

Rated voltage	**Conductor**			**Type E or X**			**Type LSE or LSX**			**Type P**				
Phase to phase (V)	**(mm^2)**	**(AWG or kcmil)**		**(mm)**	**(in)**		**(mm)**	**(in)**		**(mm)**	**(in)**			
1001–2000	0.96-7.00	(18–9)		1.14	(0.045)		1.14	(0.045)		1.14	(0.045)			
	7.01–34.0	(8–2)		1.40	(0.055)		1.40	(0.055)		1.40	(0.055)			
	34.1–85.0	(1–3/0)		1.65	(0.065)		1.65	(0.065)		1.65	(0.065)			
	85.1–107	(4/0)		1.65	(0.065)		1.65	(0.065)		1.65	(0.065)			
				—			—			2.67	(0.105)	(HD)		
	108–254	(213–500)		1.90	(0.075)		1.90	(0.075)		1.90	(0.075)			
				—			—			2.67	(0.105)	(HD)		
	255–400	(501–777)		2.29	(0.090)		2.29	(0.090)		2.29	(0.090)			
				—			—			3.05	(0.120)	(HD)		
	401–508	(778–1000)		2.29	(0.090)		2.29	(0.090)		2.29	(0.090)			
				—			—			3.05	(0.120)	(HD)		
	509–1015	(1001–2000)		2.79	(0.110)		2.79	(0.110)		2.79	(0.110)			
				—			—			3.05	(0.120	(HD)		
2.4 kV to 35 kV	Refer to UL 1072 or NEMA WC74 for insulation thicknesses. For non-shielded 2.4kV cables, the insulation and jacket thicknesses shall be in accordance with those for wet location use.													

NOTE—Minimum point is 90% of minimum average for 0–2000 volt cables.

(HD) Heavy-duty insulation thicknesses should be considered for applications where installations and service conditions are such that the additional mechanical protection is considered necessary. Heavy-duty (HD) constructions are permitted supplied in single conductor sizes 4/0 AWG and larger for applications as cable external to enclosures for interconnection purposes. Where HD thicknesses are used on single conductor cables, and the thickness is applied in two layers, both layers of material should be Type P material.

Table 16—Jacket properties; types T, CP, N, and CPE

Jacket material	Thermo-plastic polyvinyl chloride	Thermoset chloro-sulfonated polyethylene	Thermoset neoprene	Thermoset chlorinated polyethylene
Jacket type designation	T[a]	CP[b]	N[c]	CPE[c]
Physical requirements unaged				
Tensile strength, N/mm^2 (lbf/in^2), min	10.3 (1500)	12.5 (1800)	12.5 (1800)	12.5 (1800)
Elongation at rupture, min %	100	300	300	300
Set, max %	—	30	20	30
For 60 °C (140 °F) rated jacket, aging requirements:				
After air oven at °C (°F)	100 ± 1 (212 ± 2)	100 ± 1 (212 ± 2)	100 ± 1 (212 ± 2)	100 ± 1 (212 ± 2)
Hours	120	168	168	168
Tensile strength, % of unaged, min	85	85	50	85
Elongation at rupture, % of unaged, min	60	65	50	55
For 75 °C (167 °F) rated jacket, aging requirements:				
After air oven at °C (°F)	100 ± 1 (212 ± 2)	113 ± 1 (235 ± 2)	100 ± 1 (212 ± 2)	113 ± 1 (235 ± 2)
Hours	240	168	240	168
Tensile strength, % of unaged, min	85	85	50	85
Elongation at rupture, % of unaged, min	60	65	50	55
For 90 °C (194 °F) rated jacket, aging requirements:				
After air oven at °C (°F)	121 ± 1 (249 ± 2)	121 ± 1 (249 ± 2)	121 ± 1 (249 ± 2)	121 ± 1 (249 ± 2)
Hours	168	168	240	168
Tensile strength, % of unaged, min	85	85	6.2 N/mm^2[d] (900 lbf/in^2)	85
Elongation at rupture, % of unaged, min	60	65	50%[d]	55
After oil immersion at °C (°F)	70 ± 1 (158 ± 2)	121 ± 1 (249 ± 2)	121 ± 1 (249 ± 2)	121 ± 1 (249 ± 2)
Hours	4	18	18	18

Table 16—Jacket properties; types T, CP, N, and CPE

Jacket material	Thermo-plastic polyvinyl chloride	Thermoset chloro-sulfonated polyethylene	Thermoset neoprene	Thermoset chlorinated polyethylene
Tensile strength, % of unaged, min	80	60	80	60
Elongation at rupture, % of unaged, min	60	60	60	60
Sunlight Resistance[e]	Pass	Pass	Pass	Pass
Heat distortion at 121°C ± 1°C (249°F ± 2°F), max %	50	—	—	—
Heat shock, at 121°C ± 1°C (249°F ± 2°F)	no cracks	—	—	—
Mechanical water absorption, mg/cm^2 (mg/in^2), max	3.88 (25)	15.5 (100)	20.2 (130)	20.2 (130)
Tear, N/mm (lbf/in), min[f]	6.1 (35)	6.1 (35)	6.1 (35)	6.1 (35)

[a]For test procedures, refer to NEMA WC 57.
[b]For test procedures, refer to NEMA WC 70.
[c]For test procedures, refer to NEMA WC 70 for 0–2000 V or NEMA WC 74 for 2001 V and greater.
[d]Actual values, not retention of unaged values.
[e]For test procedures, refer to UL 1581 Section 1200 for a 720 h exposure.
[f]For test procedures, refer to ASTM D470.

Table 17—Low-smoke, halogen-free jacket properties: types L (XLPO) and TPO (TPPO)

Jacket material	Thermoset cross-linked polyolefin (XLPO)	Thermoplastic polyolefin (TPPO)
Jacket type designation	L	TPO
Physical requirements Unaged:		
Tensile strength, N/mm^2 (lbf/in^2), min	8.9 (1300)	9.6 (1400)
Elongation at rupture, min %	160	100
Aging requirements: after air oven at		
Temperature °C (°F)	121 ±1 (249 ±2)	100 ± 1 (212 ±2)
Duration (hours)	168	168

Table 17—Low-smoke, halogen-free jacket properties: types L (XLPO) and TPO (TPPO)

Jacket material	Thermoset cross-linked polyolefin (XLPO)	Thermoplastic polyolefin (TPPO)
Tensile strength, % of unaged, min	60	75
Elongation at rupture, % of unaged, min	60	60
After oil immersion (ASTM No. 2 or IRM 902)		
Temperature °C (°F)	121 ± 1 (249 ±2)	70 ± 1 (158 ±2)
Duration (hours)	18	4
Tensile strength, % retention	50	60
Elongation, % retention	50	60
Heat distortion at °C (°F)	121 ± 1 (249 ±2)	90 ± 1 (194 ±2)
Max %	30	25
Sunlight Resistance[a]	Pass	Pass
Acid gas equivalent, pH min[b]	3.56	3.56
Halogen content, % max[c]	0.2	0.2
Smoke index, max[e]	25	25
Toxicity index, max[f]	5	5
Hot creep test per ICEA T-28-562 with following modifications:		
Temperature of air oven °C (°F)	200 ± 2 (392 ±3)	
Hot creep elongation, max	25%	—
Hot creep set, max	5%	—
Tear, N/mm (lbf/in), min[d]	6.1 (35)	6.1 (35)
NEMA test procedure reference	NEMA WC 57, Part 7	NEMA WC 57, Part 7

[a]For test procedures, refer to UL 1581 Section 1200 for a 720 h exposure.
[b]For test procedures, refer to IEC 60754-2.
[c]For test procedures, refer to NEMA WC 57.
[d]For test procedures, refer to ASTM D470.
[e]For test procedures, refer to NES 711.
[f]For test procedures, refer to NES 713.

Table 18—Thickness of jackets

Calculated diameter of cable under jacket, mm (in)	Jacket thickness minimum average, mm (in)
0–10.79 (0–0.425)	1.14 (0.045)[a]
10.80–17.78 (0.426–0.700)	1.52 (0.060)
17.79–38.10 (0.701–1.500)	2.03 (0.080)
38.11–63.50 (1.501–2.500)	2.79 (0.110)
63.51 and larger (2.501 and larger)	3.56 (0.140)

[a]1.52 mm (060 in) is optional for a heavy-duty jacket. Minimum point is 80% of minimum average wall.

Table 19—High-voltage ac test potentials; types E, S, X, T, T/N, LSE, LSX, LSS, and P cables

	Test potentials (kV)					
	0–300 V	301–600/1000 V	1001–2000 V		2400 V	
					Nonshielded	
Conductor AWG or circular mil						
22–19	1.5	1.5	—		—	
18–15	1.5	1.5	—		—	
14–9	—	3.5	5.5		—	
8–2	—	5.5	7.0		13.0	
1–4/0	—	7.0	8.0		13.0	
250 000–525 000	—	8.0	9.5		13.0	
525 001 and larger	—	10.0	11.5		13.0	

Rated circuit voltage phase to phase	Conductor size	100% insulation level (grounded neutral)	133% insulation level (ungrounded neutral)
2001 – 5000	8 AWG – 1111 kcmil	18	18
5001 – 8000	6 AWG – 1111 kcmil	23	28
8001 – 15000	2 AWG – 1111 kcmil	35	44
15001 – 25000	1 AWG – 1111 kcmil	52	64
25001 – 28000	1 AWG – 1111 kcmil	56	69
28001 – 35000	1/0 AWG – 1111 kcmil	69	84

Table 20—AC spark test voltage

Cable voltage rating		0–300 V	301–600/1000 V	1001/2000 V
Conductor AWG or kcmil	mm^2	AC spark test voltage (kV)		
22–20	0.32–0.52	1.75	—	—
19–16	0.53–1.31	1.75	7.5	—
15–10	1.32–5.26	1.75	7.5	10.0
9–8	5.27–8.38	—	10.0	12.5
7–2	8.39–31.3	—	10.0	12.5
1–4/0	1.4 –107.0	—	12.5	15.0
250–500	107.1– 254.0	—	15.0	17.5
501–1000	254.1–508.0	—	17.5	20.0
1001–2000	508.1–1015.0	—	20.0	22.5

Table 21—Temperature correction factor *M* [a] for adjusting insulation resistance to 15.6°C (60°F)

Temp °C (°F)	Resistivity coefficient *C* (see Results)										
	1.02	**1.04**	**1.06**	**1.08**	**1.10**	**1.12**	**1.14**	**1.16**	**1.18**	**1.20**	**1.22**
5.0 (41.0)	0.81	0.66	0.54	0.44	0.36	0.30	0.25	0.21	0.17	0.14	0.12
6.0 (42.8)	0.83	0.69	0.57	0.48	0.40	0.34	0.28	0.24	0.20	0.17	0.15
7.0 (44.6)	0.84	0.71	0.61	0.52	0.44	0.38	0.32	0.28	0.24	0.21	0.18
8.0 (46.4)	0.86	0.74	0.64	0.56	0.48	0.42	0.37	0.32	0.28	0.25	0.22
9.0 (48.2)	0.88	0.77	0.68	0.60	0.53	0.47	0.42	0.38	0.34	0.30	0.27
10.0 (50.0)	0.90	0.80	0.72	0.65	0.59	0.53	0.48	0.44	0.40	0.36	0.33
11.0 (51.8)	0.91	0.83	0.76	0.70	0.65	0.59	0.55	0.51	0.47	0.43	0.40
12.0 (53.6)	0.93	0.87	0.81	0.76	0.71	0.66	0.62	0.59	0.55	0.52	0.49
13.0 (55.4)	0.95	0.90	0.86	0.82	0.78	0.74	0.71	0.68	0.65	0.62	0.60
14.0 (57.2)	0.97	0.94	0.91	0.88	0.86	0.83	0.81	0.79	0.77	0.75	0.73
15.0 (59.0)	0.99	0.98	0.97	0.95	0.94	0.93	0.92	0.91	0.91	0.90	0.89
15.6 (60.0)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
16.0 (60.8)	1.01	1.02	1.02	1.03	1.04	1.05	1.05	1.06	1.07	1.08	1.08
17.0 (62.6)	1.03	1.06	1.08	1.11	1.14	1.17	1.20	1.23	1.26	1.29	1.32
18.0 (64.4)	1.05	1.10	1.15	1.20	1.26	1.31	1.37	1.43	1.49	1.55	1.61
19.0 (66.2)	1.07	1.14	1.22	1.30	1.38	1.47	1.56	1.66	1.76	1.86	1.97
20.0 (68.0)	1.09	1.19	1.29	1.40	1.52	1.65	1.78	1.92	2.07	2.23	2.40
21.0 (69.8)	1.11	1.24	1.37	1.52	1.67	1.84	2.03	2.23	2.44	2.68	2.93
22.0 (71.6)	1.14	1.29	1.45	1.64	1.84	2.07	2.31	2.59	2.88	3.21	3.57

Table 21—Temperature correction factor *M* [a] for adjusting insulation resistance to 15.6°C (60°F)

Temp °C (°F)	Resistivity coefficient *C* (see Results)										
	1.02	**1.04**	**1.06**	**1.08**	**1.10**	**1.12**	**1.14**	**1.16**	**1.18**	**1.20**	**1.22**
23.0 (73.4)	1.16	1.34	1.54	1.77	2.02	2.31	2.64	3.00	3.40	3.85	4.36
24.0 (75.2)	1.18	1.39	1.63	1.91	2.23	2.59	3.01	3.48	4.02	4.63	5.31
25.0 (77.0)	1.20	1.45	1.73	2.06	2.45	2.90	3.43	4.04	4.74	5.55	6.48
26.0 (78.8)	1.23	1.50	1.83	2.23	2.69	3.25	3.91	4.68	5.59	6.66	7.91
27.0 (80.6)	1.25	1.56	1.94	2.40	2.96	3.64	4.45	5.43	6.60	7.99	9.65
28.0 (82.4)	1.28	1.63	2.06	2.60	3.26	4.08	5.08	6.30	7.79	9.59	11.77
29.0 (84.2)	1.30	1.69	2.18	2.80	3.59	4.57	5.79	7.31	9.19	11.51	14.36
30.0 (86.0)	1.33	1.76	2.31	3.03	3.95	5.11	6.60	8.48	10.84	13.81	17.52
31.0 (87.8)	1.36	1.83	2.45	3.27	4.34	5.73	7.52	9.83	12.79	16.57	21.38
32.0 (89.6)	1.38	1.90	2.60	3.53	4.77	6.41	8.58	11.41	15.10	19.89	26.08
33.0 (91.4)	1.41	1.98	2.76	3.82	5.25	7.18	9.78	13.23	17.81	23.86	31.82
34.0 (93.2)	1.44	2.06	2.92	4.12	5.78	8.05	11.14	15.35	21.02	28.64	38.82
35.0 (95.0)	1.47	2.14	3.10	4.45	6.35	9.01	12.70	17.80	24.80	34.36	47.36

[a]Calculated from the formula $M = C^{(t - 15.6)}$ in which C is determined as described in 5.17.4 and t is the temperature of the cable in degrees Celsius.

Table 22—Color code (NEMA WC 57 Table E-1)

Conductor Number	Base color	Tracer color	Tracer color	Conductor number	Base color	Tracer color	Tracer color
1	Black			35	White	Red	Orange
2	White			36	Orange	White	Blue
3	Red			37	White	Red	Blue
4	Green			38	Black	White	Green
5	Orange			39	White	Black	Green
6	Blue			40	Red	White	Green
7	White	Black		41	Green	White	Blue
8	Red	Black		42	Orange	Red	Green
9	Green	Black		43	Blue	Red	Green
10	Orange	Black		44	Black	White	Blue
11	Blue	Black		45	White	Black	Blue
12	Black	White		46	Red	White	Blue
13	Red	White		47	Green	Orange	Red
14	Green	White		48	Orange	Red	Blue
15	Blue	White		49	Blue	Red	Orange
16	Black	Red		50	Black	Orange	Red
17	White	Red		51	White	Black	Orange
18	Orange	Red		52	Red	Orange	Black
19	Blue	Red		53	Green	Red	Blue
20	Red	Green		54	Orange	Black	Blue
21	Orange	Green		55	Blue	Black	Orange
22	Black	White	Red	56	Black	Orange	Green
23	White	Black	Red	57	White	Orange	Green
24	Red	Black	White	58	Red	Orange	Green
25	Green	Black	White	59	Green	Black	Blue
26	Orange	Black	White	60	Orange	Green	Blue
27	Blue	Black	White	61	Blue	Green	Orange
28	Black	Red	Green	62	Black	Red	Blue
29	White	Red	Green	63	White	Orange	Blue
30	Red	Black	Green	64	Red	Black	Blue
31	Green	Black	Orange	65	Green	Orange	Blue
32	Orange	Black	Green	66	Orange	White	Red
33	Blue	White	Orange	67	Blue	White	Red
34	Black	White	Orange	68	Black	Green	Blue