



## MATERIAL SPECIFICATION P&amp;H NO. 2054

Ver 04, 04-03

**CABLE - POWER AND CONTROL; MULTI-CONDUCTOR - 600 VOLT****1.0 SCOPE**

- 1.1 This specification covers a 600 volt, stranded, multi-conductor cable. The individual conductors have a polyvinyl/nylon insulation and the cable assembly has a polyvinyl jacket. The power and control cable is designed for use in continuous rigid cable supports in compliance with Articles 300 and 310, Latest Issue, of the NEC, based on the THWN-THNN rating and UL listing of the single conductors, and UL listing of the cable as Type TC Article 340 of the NEC.
- 1.2 Cable of this type is further characterized as having excellent resistance of moisture, weather, ozone, acids, alkali and flame and has good low temperature flexibility.
- 1.3 Temperature rating for this cable is -40°C (-40°F) at ambient air temperatures and at a maximum conductor temperature of 90°C (194°F) based on the THHN rating, or 75°C (167°F) based on the THWN rating for operational purposes.

**2.0 CONDUCTORS**

- 2.1 The conductors shall be made of bare, stranded dead soft annealed, 99% pure copper wire which meets the requirements of ASTM B3, Latest Issue, prior to stranding or insulating.
- 2.2 The number of strands and AWG size used to produce a given AWG size conductor and other dimensional data shall be in accordance with that shown in Table 1.
- 2.3 AWG conductor sizes 18 and 16 shall be bunch-stranded, Class K in accordance with ASTM B174, Latest Issue. Other sizes shall be concentric-stranded, Class C in accordance with ASTM B8, Latest Issue.
- 2.4 The AWG conductor size and the number of conductors per cable shall be as specified on the purchase order.

**3.0 INSULATION**

- 3.1 Each conductor shall be primarily insulated with a color-coded, heat resistant, 90°C (194°F) polyvinyl chloride (PVC), UL listed for use in types THWN, 75°C (167°F), THHN, 90°C (194°F) and TFFN for AWG sizes 18 and 16, 90°C (194°F), and shall meet the requirements of IPCEA S-61-402, Latest Issue.
- 3.2 The average thickness of the PVC insulation shall not be less than:  
15 mils for AWG sizes 12, 14, 16 and 18  
20 mils for AWG size 10  
30 mils for AWG sizes 8 and 6
- 3.3 The minimum thickness of the PVC insulation at any point shall not be less than 90% of the specified average thickness.

**4.0 INSULATION COVERING**

- 4.1 Each individual PVC insulated conductor shall be covered with a protective layer of an UL listed, low moisture absorption type of clear nylon.
- 4.2 The minimum thickness of the nylon covering shall not be less than:  
4 mils for AWG sizes 18 to 10  
5 mils for AWG sizes 8 and 6

*Lynn -  
Here is the  
full spec  
on that Tray  
Cable*

**MATERIAL SPECIFICATION P&H NO. 2054****ISSUE NO. 3, 8-28-95****5.0 COLOR CODING**

5.1 When the conductors composing a cable are AWG size 10 and smaller, they shall be dual coded as follows:

5.1.1 Color - The PVC insulation shall be permanently color-coded in accordance with ~~IPCEA Standard S-61-402, Method 1, Latest Issue.~~ For cables having more than 21 conductors, the initial 21 color combinations shall be repeated in regular sequence the chart below. Note the different sequence of color-coding for cables 21 conductors and under and those over 21 conductors.

COMMON COLOR SEQUENCE (ICEA Standards)					
Conductor Number	Background or Base Color	Tracer Color	Conductor Number	Background or Base Color	Tracer Color
<b>SEQUENCE DESIGNATION K-1 (21 conductors or less)</b>					
1	Black	—	12	Black	White
2	White	—	13	Red	White
3	Red	—	14	Green	White
4	Green	—	15	Blue	White
5	Orange	—	16	Black	Red
6	Blue	—	17	White	Red
7	White	Black	18	Orange	Red
8	Red	Black	19	Blue	Red
9	Green	Black	20	Red	Green
10	Orange	Black	21	Orange	Green
11	Blue	Black			
<b>SEQUENCE DESIGNATION K-2 (more than 21 conductors)</b>					
1	Black	—	19	Orange	Blue
2	Red	—	20	Yellow	Blue
3	Blue	—	21	Brown	Blue
4	Orange	—	22	Black	Orange
5	Yellow	—	23	Red	Orange
6	Brown	—	24	Blue	Orange
7	Red	Black	25	Yellow	Orange
8	Blue	Black	26	Brown	Orange
9	Orange	Black	27	Black	Yellow
10	Yellow	Black	28	Red	Yellow
11	Brown	Black	29	Blue	Yellow
12	Black	Red	30	Orange	Yellow
13	Blue	Red	31	Brown	Yellow
14	Orange	Red	32	Black	Brown
15	Yellow	Red	33	Red	Brown
16	Brown	Red	34	Blue	Brown
17	Black	Blue	35	Orange	Brown
18	Red	Blue	36	Yellow	Brown

5.1.2 Number - Each conductor shall be identified along its entire length by sequential numbers printed, without repetition, on two sides 180 apart. For the first 37 conductors, the imprint shall be alphanumeric (1 ONE; 2 TWO; 3 THREE; etc.). Additional conductors shall be identified with numerals only (38, 39, etc.). Printing shall contrast with the insulation color to ensure legibility.

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5.2 When the conductors composing a cable are AWG size 8 and larger, the individual conductors shall be insulated with black PVC and shall be phase marked by number in a contrasting color in accordance with IPCEA Standard S-61-402, Method 4, Latest Issue.

5.3 The above coding shall apply unless otherwise specified on the purchase order or as otherwise negotiated.

6.0 CABLE ASSEMBLY

6.1 The required number of insulated and covered conductors (coded) - 2 or more conductors of AWG sizes 8 and larger, and 3 or more conductors of AWG sizes 10 and smaller - arranged in the specified size sequence, shall be cabled round and a suitable binder tape applied with a 25% minimum overlap.

6.2 Suitable non-hygroscopic fillers shall be used where necessary to give the cable a substantially circular (round) cross section.

6.3 Conductors shall be twisted with a left hand lay, and the lay length shall not be greater than 15 times the diameter of the core.

7.0 JACKET

7.1 The jacket or protecting sheath shall be a polyvinyl (PVC) compound which meets the requirements defined in the appropriate section of IPCEA Standard S-61-402, Latest Issue.

7.2 The jacket thickness shall not be less than the following specified:

Diameter Under Jacket (a) Inches	Jacket Thickness (Mils)	
	Nom.	Min.
0.425 or less	45	35
0.426 to 0.700	60	50
0.701 to 1.500	80	65
(a) Jacket thickness of all cables shall be based on a calculated core diameter using specified dimensions of the conductor composite insulation.		

8.0 MARKING

8.1 The cable jacket shall be stencilled or branded every two feet with the manufacturer's name, the trade name or trade mark, the gage and number of conductors, the voltage, the type, and the UL monogram to indicate it meets all the requirements of this type of cable.

9.0 PACKAGING AND LOADING

9.1 Material furnished under this specification shall be packaged as agreed upon between supplier and purchaser.

9.2 In the absence of such an agreement or specific instructions, the material shall be packaged in accordance with good commercially acceptable practices to prevent loss or damage in handling or transportation.

9.3 All shipping notices shall include the Customer's Purchase Order Number.

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**10.0 IDENTIFICATION**

10.1 Material shall be tagged or identified as per standard practice. All means of identification must show the following information:

10.1.1 Customer's Name and Purchase Order Number

10.1.2 Supplier's Name

10.1.3 Type of Cable - P&H 2054

10.1.4 Gage, Number of Conductors and Length

10.1.5 The UL label or tag shall also be included as a means of identification to show cable furnished meets such requirements.

**11.0 INSPECTION AT PURCHASER'S WORKS**

11.1 Acceptance of material furnished under this specification shall be subject to confirmation by the Customer's Quality Control and Electrical Engineering Departments.

11.2 The purchaser shall have the option of accepting or rejecting material that fails to meet any of the requirements of this specification. Likewise, any damaged material, obvious to casual observation, shall be subject to rejection.

11.3 In the event of rejection, the producer shall be granted a hearing at his request.

**12.0 APPROVED SUPPLIERS**

12.1 Alpha Wire Corporation  
P.O. Box 711  
711 Ledgerwood Avenue  
Elizabeth NJ 07207

12.2 Brand Rex Company  
P.O. Box 498  
West Main Street  
Willimantic, CT 06226

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Table 1 - Power and Control Cable Construction and Dimensional Data 18 AWG Stranded 16/30 Bare Copper				
Conductors, color coded and numbered TFFN (PVC/NYLON); cabled with fillers, where necessary; cable tape; PVC jacket overall				
Number of Conductors	Outer Jacket Thickness inches	Approx Cable O.D. Inches	Approx Cable Area - in <sup>2</sup>	Approx Wgt M Ft-Lbs
3	.045	.300	.071	48
4	.045	.325	.083	59
5	.045	.355	.099	69
6	.045	.385	.116	80
7	.045	.385	.116	87
8	.045	.415	.135	98
9	.045	.445	.156	110
10	.045	.480	.181	119
12	.045	.495	.192	137
13	.060	.550	.238	164
14	.060	.550	.238	170
15	.060	.580	.264	184
16	.060	.580	.264	190
17	.060	.610	.292	206
18	.060	.610	.292	212
19	.060	.610	.292	218
20	.060	.640	.322	233
21	.060	.640	.322	238
22	.060	.670	.353	255
23	.060	.670	.353	260
24	.060	.725	.413	270
25	.060	.725	.413	275
26	.060	.725	.413	280
27	.060	.735	.424	286
28	.060	.750	.442	291
29	.060	.750	.442	296
30	.060	.750	.442	301
31	.060	.775	.472	307
32	.060	.775	.472	312
33	.060	.775	.472	317
34	.060	.805	.509	323
35	.060	.805	.509	329
36	.080	.805	.509	335
37	.080	.805	.509	340

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16 AWG Stranded 26/30 Bare Copper				
Conductors, color coded and numbered TFFN (PVC/NYLON); cabled with fillers, where necessary; cable tape; PVC jacket overall				
Number of Conductors	Outer Jacket Thickness Inches	Approx Cable O.D. Inches	Approx Cable Area - in <sup>2</sup>	Approx Wgt M Ft-Lbs
3	.045	.330	.086	62
4	.045	.360	.102	74
5	.045	.390	.119	90
6	.045	.425	.142	105
7	.045	.425	.142	114
8	.045	.460	.166	129
9	.045	.495	.192	146
10	.060	.570	.255	174
12	.060	.585	.269	199
13	.060	.615	.297	217
14	.060	.615	.297	226
15	.060	.645	.327	246
16	.060	.645	.327	255
17	.060	.680	.363	273
18	.060	.680	.363	283
19	.060	.680	.363	292
20	.060	.715	.402	312
21	.060	.715	.402	320
22	.060	.750	.442	343
23	.060	.750	.442	349
24	.060	.810	.515	363
25	.060	.810	.515	371
26	.080	.810	.515	387
27	.080	.820	.528	403
28	.080	.880	.608	419
29	.080	.880	.608	435
30	.080	.880	.608	451
31	.080	.910	.650	467
32	.080	.910	.650	483
33	.080	.910	.650	499
34	.080	.945	.701	515
35	.080	.945	.701	531
36	.080	.945	.701	547
37	.080	.945	.701	565

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14 AWG Stranded 19/0147 Bare Copper				
Conductors, color coded and numbered THHN-THWN (PVC/NYLON); cabled with fillers, where necessary; cable tape; PVC jacket overall				
Number of Conductors	Outer Jacket Thickness Inches	Approx Cable O.D. Inches	Approx Cable Area - in <sup>2</sup>	Approx Wgt M Ft-Lbs
3	.045	.345	.093	78
4	.045	.375	.110	97
5	.045	.405	.129	116
6	.045	.440	.152	136
7	.045	.440	.152	151
8	.045	.475	.177	171
9	.045	.510	.204	194
10	.060	.585	.269	227
12	.060	.605	.287	261
13	.060	.630	.312	284
14	.060	.630	.312	298
15	.060	.665	.347	324
16	.060	.665	.347	337
17	.060	.700	.385	362
18	.060	.700	.385	376
19	.060	.700	.385	389
20	.060	.735	.424	416
21	.060	.735	.424	428
22	.060	.770	.466	457
23	.060	.770	.466	467
24	.060	.875	.601	486
25	.080	.875	.601	510
26	.080	.875	.601	530
27	.080	.885	.615	550
28	.080	.905	.643	570
29	.080	.905	.643	585
30	.080	.905	.643	610
31	.080	.940	.694	630
32	.080	.940	.694	644
33	.080	.940	.694	665
34	.080	.970	.739	680
35	.080	.970	.739	700
36	.080	.970	.739	720
37	.080	.970	.739	740

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12 AWG Stranded 19/.0185 Bare Copper				
Conductors, color coded and numbered THHN-THWN (PVC/NYLON); cabled with fillers, where necessary; cable tape; PVC jacket overall				
Number of Conductors	Outer Jacket Thickness Inches	Approx Cable O.D. Inches	Approx Cable Area - in <sup>2</sup>	Approx Wgt M Ft-Lbs
3	.045	.385	.116	108
4	.045	.420	.139	136
5	.045	.460	.166	165
6	.045	.500	.196	185
7	.045	.500	.196	216
8	.060	.570	.255	262
9	.060	.610	.292	294
10	.060	.665	.347	324
12	.060	.685	.369	376
13	.060	.720	.407	409
14	.060	.720	.407	430
15	.060	.760	.454	465
16	.060	.760	.454	486
17	.060	.800	.503	522
18	.060	.800	.503	543
19	.060	.800	.503	566
20	.080	.880	.608	636
21	.080	.880	.608	655
22	.080	.920	.665	698
23	.080	.920	.665	716
24	.080	.995	.778	745
25	.080	.995	.778	769
26	.080	.995	.778	800
27	.080	1.005	.793	822
28	.080	1.025	.825	860
29	.080	1.025	.825	890
30	.080	1.025	.825	930
31	.080	1.065	.891	954
32	.080	1.065	.891	977
33	.080	1.065	.891	1004
34	.080	1.105	.959	1028
35	.080	1.105	.959	1049
36	.080	1.105	.959	1070
37	.080	1.105	.959	1091



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10 AWG Stranded 19/.0234 Bare Copper				
Conductors, color coded and numbered THHN-THWN (PVC/NYLON); cabled with fillers, where necessary; cable tape; PVC jacket overall				
Number of Conductors	Outer Jacket Thickness Inches	Approx Cable O.D. Inches	Approx Cable Area - in <sup>2</sup>	Approx Wgt M Ft-Lbs
3	.045	.455	.163	163
4	.045	.500	.196	224
5	.045	.575	.260	266
6	.060	.625	.307	317
7	.060	.625	.307	349
8	.060	.680	.363	396
9	.060	.730	.419	446
10	.080	.795	.496	521
12	.080	.865	.588	606

8 AWG - 2 AWG					
Conductors, THHN-THWN, phase marked per IPCEA Standard S-61-402, Method 4, Latest Issue; cabled with fillers, where necessary; cable tape; PVC jacket overall					
Size	No. of Cond.	Outer Jacket Thickness Inches	Approx Cable O.D. Inches	Approx Cable Area - in <sup>2</sup>	Approx Wgt M Ft-Lbs
8 AWG	3	.060	.605	.287	270
19/.0295	4	.060	.660	.342	340
6 AWG	3	.060	.684	.367	386
19/.0732	4	.060	.760	.454	488
4 AWG	3	.080	.890	.622	630
19/.0469	4	.080	.975	.747	790
3 AWG	3	.080	1.025	.825	895
19/.0591	4	.080	1.125	.994	1145