



The Electrical Cable Specialists

ECS REEL REPORT

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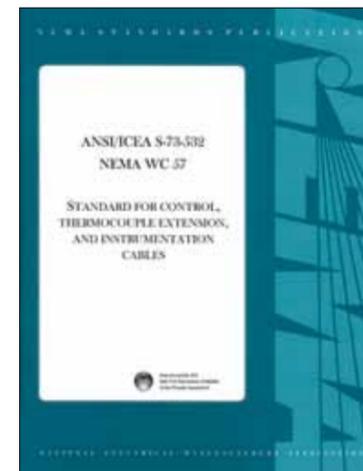
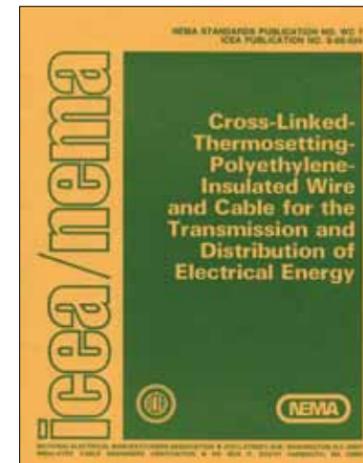


Almost every week a question about color codes comes up. This issue of The Reel Report focuses on the two most common control cable color codes and we hope it will be helpful. If you have questions which are not addressed, give us a call. If you have areas you would like to see covered in future issues of the ECS Reel Report, please send your suggestions to info@ecscable.com.

Joe Riedel
President



The Electrical Cable Specialists



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E-2 or K-2 / E-1 or K-1 –What’s the Difference?

Some form of this question comes up regularly: “Your quote states the color code is E-2 but the project specifications call for a K-2 color code. What is the difference?”

To understand the difference, it is helpful to know the source of these color codes and to remember the difference between conductor identification methods and color codes. Color codes and conductor identification methods are not the same topic. The following assumes the conductor identification Method 1—Colored Compounds with Tracers, which is the most common method of control cable identification in the U.S.

In the beginning, the Insulated Cable Engineers Association (ICEA) published material-based standards which were used as guidelines for cable manufacture. The two most commonly referenced control cable standards were ICEA S-66-524 (the XLPE standard) and ICEA S-68-516 (the EPR standard). Both standards addressed “Conductor Identification for Control Cable” in Appendix K. Since the color code sequence tables were in Appendix K, the tables were identified as K-1, K-2, K-3, etc.

In the late 80’s, ICEA began the laborious task of replacing the material-based standards with application-based standards. The old standards were rescinded as new ones were adopted. One of the first of the new standards to be adopted was ICEA S-73-532, Standard for Control Cables (1991). The conductor identification methods and color code charts in the new control cable standard were placed in Appendix E, and the color sequence tables were now identified as Table E-1, E-2, E-3, etc. Table E-1 of the applications-based standard exactly matched the first 21 conductors of Table K-1 of the withdrawn material-based standard, but also continued to include up to 127 conductors. Table E-2 of the applications-based standard exactly matched Table K-2 of the withdrawn material-based standards. Therefore, whether it is E-2 or K-2 it is exactly the same color code!

Should I Be Using E-1 or E-2 Color Code?

The Table E-1 color code chart includes white as the second conductor and green as the fourth conductor. This color sequence is sometimes referred to as the "utility color code". The Table E-2 color code chart contains no white or green and is sometimes referred to as the "National Electrical Code (NEC) color code".

"Where the conditions of maintenance and supervision ensure that only qualified persons service the installation", the NEC allows colored insulated conductors in a multiconductor cable to be "permanently identified", at the time of installation as a white or green.

GOING GREEN...

The last sentence of the first paragraph of NEC 250.119 states; "Conductors with insulation or individual covering that is green, green with one or more yellow stripes, or otherwise identified and permitted by this section shall NOT be used for un-grounded or grounded circuit conductors". However, Part (B) of this section for multi-conductor cable states, "insulated conductors in a multiconductor cable, at the time of installation, shall be permitted to be permanently identified as equipment grounding conductors at each end and at every point where conductors are accessible by one of the following means" and proceeds to name those methods including using green tape. So the NEC allows you to field identify an insulated conductor as a grounding conductor, but it most definitely does not allow for a conductor already identified as a grounding conductor (bare or green) to be field identified as anything else.

WHAT ABOUT WHITE?

Exception No. 1 to Part 200.6 (E) allows the grounded conductor in a multiconductor cable to be permanently identified at the terminations by distinctive white marking or other effective means. However, Part 200.7 (A) says, "the following shall be used ONLY for the grounded circuit conductor, unless otherwise permitted in 200.7(B) and (C)" and lists white, gray, etc. Parts (B) and (C) have some exceptions including using the white as a traveler in a piece of NM-B in 3-way switches in your house, but these exceptions do not include a multiconductor tray cable. So the NEC allows for you to field identify an insulated conductor as a grounded conductor, but it does not allow for a conductor already identified as a grounded conductor (white, gray, etc.) to be field identified as anything else.

E-1 COLOR SEQUENCE

	BASE COLOR	FIRST TRACER	SECOND TRACER	COLOR DE FONDO	ROTULO	
1	Black	-	-	Negro	-	
2	White	-	-	Blanco	-	
3	Red	-	-	Rojo	-	
4	Green	-	-	Verde	-	
5	Orange	-	-	Naranja	-	
6	Blue	-	-	Azul	-	
7	White	Black	-	Blanco	Negro	
8	Red	Black	-	Rojo	Negro	
9	Green	Black	-	Verde	Negro	
10	Orange	Black	-	Naranja	Negro	
11	Blue	Black	-			
12	Black	White	-			
13	Red	White	-			
14	Green	White	-			
15	Blue	White	-			
16	Black	Red	-			
17	White	Red	-			
18	Orange	Red	-			
19	Blue	Red	-			
20	Red	Green	-			
21	Orange	Green	-			
22	Black	White	Red			
23	White	Black	Red			
24	Red	Black	White			
25	Green	Black	White			
26	Orange	Black	White			
27	Blue	Black	White			
28	Black	Red	Green			
29	White	Red	Green			
30	Red	Black	Green			
31	Green	Black	Orange			
32	Orange	Black	Green			
33	Blue	White	Orange			
34	Black	White	Orange			
35	White	Red	Orange			
36	Orange	White	Blue			
37	White	Red	Blue			

Why is E-1 Called the "Utility Color Code"?

Installations under the exclusive control of an electric utility are not covered by the NEC. In addition, most utilities have a long history of using four conductor control cable in E-1 (K-1) color code (black, white, red, green) for control transformer (CT) and potential transformer (PT) applications where the white and green are not used as grounded or grounding conductors. Since this application would not be allowed in installations under the jurisdiction of the NEC, the E-1 color code is sometimes referred to as the "utility color code."

E-2 COLOR SEQUENCE

	BASE COLOR	TRACER	COLOR DE FONDO	ROTULO	
1	Black	-	Negro	-	
2	Red	-	Rojo	-	
3	Blue	-	Azul	-	
4	Orange	-	Naranja	-	
5	Yellow	-	Amarillo	-	
6	Brown	-	Moreno	-	
7	Red	Black	Rojo	Negro	
8	Blue	Black	Azul	Negro	
9	Orange	Black	Naranja	Negro	
10	Yellow	Black	Amarillo	Negro	
11	Brown	Black			
12	Black	Red			
13	Blue	Red			
14	Orange	Red			
15	Yellow	Red			
16	Brown	Red			
17	Black	Blue			
18	Red	Blue			
19	Orange	Blue			
20	Yellow	Blue			
21	Brown	Blue			
22	Black	Orange			
23	Red	Orange			
24	Blue	Orange			
25	Yellow	Orange			
26	Brown	Orange			
27	Black	Yellow			
28	Red	Yellow			
29	Blue	Yellow			
30	Orange	Yellow			
31	Brown	Yellow			
32	Black	Brown			
33	Red	Brown			
34	Blue	Brown			
35	Orange	Brown			
36	Yellow	Brown			

But What About this Color Code?

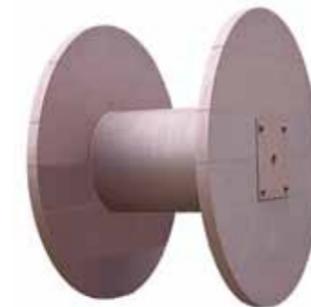
The E-1 and E-2 color codes discussed above are just two of many color codes sequences referred to throughout the cable industry. However, the sequence of colors on your job may not fit either the E-1 or E-2 color sequence charts.

In future issues of the Reel Report, we will discuss various methods of color coding and different color codes. We'll answer questions about color coding on fiber optic cable, power cables and many different applications. In the meantime, if you need assistance on a color code, contact us at 770-446-2222 or info@ecscable.com.

Summary

When you see a specification reference for K-2 Color Code and the manufacturer's catalog sheet is calling out conductor identification as E-2 color code, there is no need to panic. Both references identify the exact same color sequence. For practical purposes, E-1 and K-1 are also the same sequence.

E-2 color code may offer more versatility. For example, any of the first four colors in the E-2 color code (black, red, blue, orange) may be field identified as either a grounded or grounding conductor. However, two of the first four colors in the E-1 color code (black, white, red, green) may not be field identified as an ungrounded conductor.



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