

## IEC Medium Voltage Cable Standards

The International Electrotechnical Commission (IEC) is a global organization that prepares and publishes international standards for electrical and electronic products. Its membership consists of over 50 countries, including all major trading nations and a growing number of industrializing countries. IEC cable standards are widely used throughout the world.

However in North America, medium voltage (5 kV through 35 kV) cables usually meet AEIC (Association of Edison Illuminating Companies), ICEA (Insulated Cable Engineers Association), CSA (Canadian Standards Association) and/or UL (Underwriters Laboratories) requirements. Medium voltage cables made in North America seldom meet IEC requirements. IEC medium voltage cable requirements are covered in IEC Standard 502 "Extruded Solid Dielectric Insulated Power Cables for Rated Voltages from 1 kV up to 30 kV".

### IEC and North American MV Standards Compared

Overall, AEIC standards are the most stringent, followed by ICEA, CSA and UL (which are all similar) and then IEC. Although the differences between IEC and North American MV cable standards are many, a few examples should help illustrate the differences:

- IEC's standard voltage ratings and corresponding insulation thicknesses are different than North American values as shown in the tables at right.
- IEC cables are manufactured to standard square millimeter (mm<sup>2</sup>) sizes while North American cables are usually made to standard American Wire Gauge (AWG) or kcmil sizes. A 500 kcmil conductor, for instance, is equivalent to a 254 mm<sup>2</sup> metric conductor. Unfortunately, the nearest standard metric sizes are 240 mm<sup>2</sup> and 300 mm<sup>2</sup>. (For a complete table of standard North American and

IEC	
Standard Voltage Ratings	Insulation Thickness
kV	Mils
3	79 to 110*
6	98 to 126*
10	134
15	177
20	217
30	315

\* varies with conductor size

AEIC		
Standard Voltage Ratings		Insulation Thickness
kV	Insulation Level (%)	Mils
5	100	90
5	133	115
8	100	115
8	133	140
15	100	175
15	133	220
25	100	260
25	133	320
28	100	280
28	133	345
35	100	345
35	133	420

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metric conductor sizes as well as conversions between the two systems see page 206 of Anixter's Wire & Cable Technical Information Handbook.)

- Typical North American standards such as AEIC require microscopic examination of the cable's insulation and specifies a maximum permissible void and contaminant size—IEC considers this test unnecessary.
- Unlike IEC, AEIC requires that an Accelerated Cable Life Test (ACLT) be performed to determine a cable's susceptibility to deterioration by treeing in wet locations.
- AEIC has a resistance stability requirement for the electrical resistance of the semi-conducting conductor shield and insulation shield materials—IEC does not.

There are dozens of additional differences—some major, some minor—but I think you get the picture!

### **Not Interchangeable!**

Unfortunately, a MV cable meeting IEC standards does *not* meet North American requirements and vice versa. Years from now, when many of us are enjoying a well-deserved retirement, the wire and cable industry might succeed in developing a globally “harmonized” medium voltage cable standard. But currently we aren't even close.

Despite the efforts of more than 20 committees over the last 10 years, the industry is still working to harmonize cable standards just *within* North America and *within* Europe. *Global* harmonization is considered to be a “Phase II” project. So far, the U.S. and Canada have succeeded in harmonizing communication cables and portable cords—that's all! In Europe, CENELEC (the European committee for standardization of electrical products) has also succeeded in harmonizing a number of cable types within Europe. For more information on global wire and cable standards see **Wire Wisdoms** G-1 and G-2.

So until the entire world is “singing the same tune”, the best advice for obtaining MV cables with ratings and approvals appropriate for use in a particular country is often to obtain a locally manufactured cable that meets local standards. That's one reason Anixter has offices in over 25 countries around the world.

I guess the old adage “When in Rome, do as the Romans do.” also applies to the wire and cable industry.