TIGER TIPS

PHYSICAL PROPERTIES OF JACKETING COMPOUNDS

Tensile strength is the maximum stress of rubber components during destructive testing. A good tensile value indicates, among other things, the general toughness of a jacket. Tensile strength is measured on small specimens and calculated out to pound per square inch (psi).

Elongation at rupture is the ultimate extension of the rubber specimen prior to destruction. In a cable, the copper conductors carry the entire load and will break long before the jacket's ultimate elongation is reached. In actual service, the elongation value does not play a big role.

Elongation, when coupled, with tensile, shows the "state of cure" of the jacket when compared to ICEA (Insulated Cable Engineers Association) minimums, a very high elongation and low tensile can indicate an under cured jacket. Conversely, a very low elongation coupled with high tensile may indicate an over cured cable jacket.

Modulus, or tensile strength at 200% elongation of the rubber specimen, gives a good indication of the strength of the material even under mild elongation. Modulus is most important where 1) forces are known to elongate the copper and, hence, the jacket, and 2) where the cable is bent in a tight radius. In either case, if the outer jacket is subjected to abrasion and/or cutting, low modulus can negatively affect jacket life.

Tear strength is measured in pound per inch thickness and is an ICEA requirement for extra-heavy-duty rubber jackets. Heavy-duty jackets do not have an ICEA tear requirement. As far as overall durability, tear probably tells more than any single ICEA test. Jackets that have good tear strength usually have good abrasion resistance also. Good compounding a nd on-target curing will achieve excellent tear and abrasion performance. However, when selecting a jacket, it is best to study all values. In nearly all cases, extra-heavy-duty material will perform better than heavy-duty material in the mechanical environments of flex, torsion, and abrasion.

Abrasion index is an indication of the abrasion resistance of a jacket compound. It is a number measured per ISO 4649, with lower numbers indicating higher resistance to abrasion. In severe mining applications an abraded jacket can lead to cable failure. Although it is not an ICEA requirement, it is an important element to consider in choosing an appropriate jacket material.

Nexans AmerCable utilizes several jacket materials that meet or exceed the Extra-Heavy-Duty requirements of ICEA. Typical values for each of these materials, as well as other important characteristics, are summarized in the following table. The ICEA minimum requirements are also listed for comparison.

Comparison Tables on Back

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Typical Values

	ICEA Minimums for EHD Jackets	Chlorinated Polyethylene (CPE)	Chlorosulfonated Polyethylene (Hypalon®)	Thermoplastic Polyurethane (TPU)	Natural Rubber
Tensile Strength (PSI)	2400	2900	3000	5000	3800
Elongation @ Rapture %	300	500	500	500	480
Modulus PSI @ 200%	700	900	900	1100	825
Tear Strength lbs. per inch thickness	40	50	50	120	86
Abrasion Index per ISO 4649	No Requirement	70	74	15	56

Table II

	Chlorinated Polyethylene (CPE)	Chlorosulfonated Polyethylene (Hypalon®)	Thermoplastic Polyurethane (TPU)	Natural Rubber
Ozone Resistance	Excellent	Excellent	Excellent	Fair
Sunlight Resistance	Excellent	Excellent	Good	Good
Flame Resistance	Good	Good	Fair	Poor
Heat Resistance	Good	Good	Good	Fair
Low Temperature Flexibility	Excellent	Excellent	Good	Excellent
Oil Resistance	Good	Good	Good	Poor
Colorability	Excellent	Good	Excellent	Poor