Polyvinyl Chloride (PVC)

PVC is a relatively inexpensive and easy-to-use material, with the potential to be used in diverse applications. The maximum temperature range is -55°C to 105°C and is flame, moisture, and abrasion resistant. It also holds up against gasoline, ozone, acids, and solvents. It can also be used for medical and food related purposes as it is odorless, tasteless, and non-toxic. PVC can be used in both heavy and thin wall applications.

PVC should not be used when flexibility and an extended flex life are required at low temperatures. When used in retractile cord applications, it also shows below average flexibility. PVC displays high attenuation and capacitance loss, meaning that power is lost when used in an electrical system.

Plenum Polyvinyl Chloride (Plenum PVC)

Plenum PVC is suitable for use in building spaces behind dropped ceilings or raised floors which are left open to allow for air circulation.

Standard PVC is considered a non-plenum insulation option because it does not exhibit the qualities necessary for safe usage in plenum areas. To be plenum-rated the insulation must meet more stringent fire safety regulations.

Polyethylene (PE)

This compound is used most in coaxial and low capacitance cables because of its exemplary electric qualities. Many times it is used in these applications because it is affordable and can be foamed to reduce the dielectric constant to 1.50, making it an attractive option for cables requiring high-speed transmission. Polyethylene can also be cross-linked to produce high resistance to cracking, cut-through, soldering, and solvents. Polyethylene can be used in temperatures ranging from -65°C to 80°C.

All densities of Polyethylene are stiff, hard, and inflexible. The material is also flammable. Additives can be used to make it flame retardant, but this will sacrifice the dielectric constant and increase power loss.

Polypropylene (PP)

This material is very similar to Polyethylene, but has a wider temperature range of -30°C to 80°C. It is used primarily for thin wall primary insulations. Polypropylene can be foamed to improve its electrical properties.

Polyurethane (PUR)

Polyurethane is known for its extreme toughness, flexibility, and flex life, even in low temperatures. It also has excellent ratings for chemical, water, and abrasion resistance. This material works well in retractile cord applications and can be a good option for salt-spray and low-temperature military purposes.

Polyurethane is a flammable material. The flame retardant version sacrifices strength and surface finish. Polyurethane's main disadvantage though, is its poor electrical properties, making it suitable for jackets only.

Nylon

Nylon is usually extruded over softer insulation compounds. It serves as a tough jacket, exhibiting strong abrasion, cut-through, and chemical resistance, especially in thin wall applications. It is also extremely flexible.

One disadvantage of Nylon is its absorption of moisture which degrades some of its electrical properties.

Chlorinated Polyethylene (CPE)

CPE displays very good heat, oil, and weather resistance. Many times CPE serves as a lower cost, more environmentally friendly alternative to CSPE. Its reliable performance when exposed to fire also makes it a favorable alternative to PVC insulation.

Chlorinated Polyethylene is commonly found in power and control cables and industrial power plant applications.

COMPARATIVE PROPERTIES OF PLASTIC INSULATIONS

	PVC	LOW-DENSITY PE	CELLULAR PE	HIGH-DENSITY PE	PP	CELLULAR PP	PUR	PLENUM PVC	NYLON	CPE
Oxidation Resistance	E	E	E	E	E	E	E	E	E	E
Heat Resistance	G-E	G	G	E	E	E	G	G-E	E	E
Oil Resistance	F	G-E	G	G-E	F	F	E	F	E	E
Low Temperature Flexibility	P-G	E	E	E	P	P	G	P-G	G	E
Ozone Resistance	E	E	E	E	E	E	E	E	E	E
Weather (Sun Resistance)	G-E	E	E	E	E	E	G	G	E	E
Abrasion Resistance	F-G	G	F	E	F-G	F-G	O	F-G	E	E-O
Electrical Properties	F-G	E	E	E	E	E	P	G	P	E
Flame Resistance	E	P	P	P	P	P	P	E	P	E
Nuclear Radiation Resistance	F	G-E	G	G-E	F	F	G	F	F-G	O
Water Resistance	F-G	E	E	E	E	E	P-G	F	P-F	O
Acid Resistance	G-E	G-E	G-E	E	E	E	F	G	P-F	E
Alkali Resistance	G-E	G-E	G-E	E	E	E	F	G	E	E
Alcohol Resistance	P-E	E	E	E	E	E	P-G	G	P	E
Aliphatic Hydrocarbons Resistance (Gasoline, Kerosene)	P	G-E	G	G-E	P-F	P	P-G	P	G	E
Aromatic Hydrocarbons Resistance (Benzol, Toluol)	P-F	P	P	P	P-F	P	P-G	P-F	G	G-E
Halogenated Hydrocarbons Resistance (Degreaser Solvents)	P-F	G	G	G	P	P	P-G	P-F	G	E
Underground Burial	F-G	G	-	E	-	-	G	P	-	P

P = POOR **F = FAIR** **G = GOOD** **E = EXCELLENT** **O = OUTSTANDING**

These ratings are based on average performance of general purpose compounds. Any given property can usually be improved by the use of selective compounding.