Renusol
Solar Mounting Systems

HMWPE Information

The HMWPE (High Molecular Weight Polyethylene) used in the Renusol CS60 is a carbon impregnated polyethylene copolymer engineered for high rigidity and impact strength with unsurpassed long-term weatherability.

Common Applications:

- Automotive fuel tanks
- Reusable pallets
- Storage drums
- Oil, gas, and water piping
- Truck bed liners
- Agricultural products
- Solid waste and recycling containers
- Portable restrooms

Material Qualities:

- 100% recycled and recyclable material
- Excellent UV resistance
- Not electrically conductive
- Excellent impact resistance, rigidity and strength

High Molecular Weight Polyethylene Properties*	Typical Values (English)	Typical Values (SI)	Test Basis
Density	-	0.949 g/cm³	ASTM D4883
Brittleness Temperature < -105 °F	< -105 °F	< -76 °C	ASTM D746
Vicat Softening Temperature	248 °F	120 °C	ASTM D1525
Tensile Strength at Yield	4,000 psi	30 MPa	ASTM D638
Elongation at Break	1000%	1000%	ASTM D638
Flexural Modulus	180,000 psi	1200 MPa	ASTM D790
ESCR (100% Igepal)	> 800 hr	> 800 hr	ASTM D1693
Tensile Impact Strength (73°F or 23°C)	120 ft·lb/in²	250 kJ/m²	ASTM D1822

* Typical properties; not specifications.

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Polyethylene in Continuous UV Exposure Applications

Utility companies have been using polyethylene (PE) for piping and telephone cables in above-ground, continuous UV exposure applications since the 1960's. High-density polyethylene (HDPE) pipe typically carry potable water, wastewater, slurries, chemicals, hazardous wastes, and compressed gases. See the findings of testing and analysis below:

- "The use of carbon black of over 1% …. has been found to be adequate to protect the polymers for over 38 years of outdoor exposure. Telephone cables protected with these 2.5% black polyethylene compounds will have a useful lifetime well in excess of the forty year design lifetime. The exact useful lifetime of these black cable jackets is not easily predicted but will possibly be 50 to 75 years."

  Source : Gilroy, H. M., Polyolefin Longevity for Telephone Service, **AT&T Bell Laboratories**, Murray Hill, NJ. 1985

- "Ultraviolet Exposure: When PE pipe is utilized outdoors in above-ground applications, it will be subjected to extended periods of direct sunlight. The ultraviolet component in sunlight can produce a deleterious effect on the PE unless the material is sufficiently protected. Weathering studies have shown that pipe produced with a minimum 2.0% concentration of finely divided and evenly dispersed carbon black is protected from the harmful effects of UV radiation for indefinite periods of time. PE pipe that is protected in this manner is the principal material selected for above-ground installations."

  Source: **Plastics Pipe Institute** - Handbook of PE Pipe, Chapter 8, Above-Ground Applications for PE Pipe

- "For PE piping materials it has been shown that the most effective (UV) screen is achieved by the incorporation into the material of 2 to 3 % of finely divided carbon black, which also results in a black color. Experience and studies show that in outdoor applications such a material will retain its original performance properties for periods longer than 50-years."

  Source: **Plastics Pipe Institute** - Handbook of PE Pipe, Chapter 3, Material Properties

- "ASTM material standard D 3350 requires a minimum concentration of 2 percent carbon black. It has been demonstrated that this amount of well-dispersed very fine particle carbon black is sufficient protection for continuous outdoor service."

  Source: **Plastics Pipe Institute** - Weatherability of Thermoplastic Piping Systems TR-18/2005

Note: Both HMWPE and HDPE (High Density Polyethylene) are subsets of polyethylene. The density of HDPE can be as low as 0.941 g/cm³. The material used for the Renusol CS60 has a typical density around 0.949 g/cm³. HMWPE has longer molecular chains, which serves to transfer loads more effectively to the polymer backbone and results in a tougher, stronger material.

Background on PE Usage for Pipes

Since its discovery in 1933, PE has grown to become one of the world's most widely used and recognized thermoplastic materials. The versatility of this unique plastic material is demonstrated by the diversity of its use and applications. Today's modern PE resins are highly engineered for much more rigorous applications such as pressure-rated gas and water pipe, landfill membranes, automotive fuel tanks and other demanding applications.

PE's use as a piping material first occurred in the mid 1950's. In North America, its original use was in industrial applications, followed by rural water and then oil field production where a flexible, tough and lightweight piping product was needed to fulfill the needs of a rapidly developing oil and gas production industry. The success of PE's pipe in these installations quickly led to its use in natural gas distribution where a coilable, corrosion-free piping material could be fused in the field to assure a "leak-free" method of transporting natural gas to homes and businesses. PE's success in this critical application has not gone without notice and today it is the material of choice for the natural gas distribution industry. Sources now estimate that nearly 95% of all new gas distribution pipe installations in North America that are …. polyethylene piping.

Source: **Plastics Pipe** Handbook of PE Pipe, Chapter 1, Introduction