

HDPE verses LLDPE Geomembranes – Which Is Better?

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Over the past 40 years, **HDPE (High Density Polyethylene)** and **LLDPE (Linear Low Density Polyethylene)** geomembranes have become the dominant materials used for environmental containment. Widely used across various industries including municipal waste, water, mining, oil & gas, renewable energy, agriculture, and environmental remediation, both materials offer:

- Excellent chemical resistance
- Strong UV stability
- Long-term durability
- Economical cost



LLDPE manufactured rolls

So, which is better?

The answer depends on the specific application and site conditions. The following comparison provides guidance for selecting the appropriate material.

Material Overview

HDPE Geomembranes

- **Structure:** Higher molecular crystallinity
- **Properties:**
 - High chemical resistance
 - Excellent UV stability
 - Greater rigidity and tensile strength

- **Considerations:**

- Prone to environmental stress cracking under certain conditions
- Requires well-compacted subgrade due to low yield point.
- Ideal applications demanding maximum durability and containment integrity.

LLDPE Geomembranes

- **Structure:** Lower crystalline, more linear chains

- **Properties:**

- Superior flexibility and elasticity
- Very good chemical resistance and UV stability
- Excellent multiaxial elongation and impact resistance

- **Considerations:**

- Better suited for irregular subgrades or areas with potential soil movement
- It can be factory-fabricated, reducing field welding and installation time.
- Preferred for above ground storage tanks requiring adaptability and ease of installation.

Installation & Field Performance

Parameter	HDPE	LLDPE
Flexibility	Low	High
Yield Stress	Lower	Higher
Stress Crack Resistance	Moderate / Good	Excellent
Chemical Resistance	Excellent	Very Good

Parameter	HDPE	LLDPE
UV Resistance	Excellent	Very Good
Weldability	Field-welded by thermal wedge & extrusion	Factory-fabricated or field-welded by wedge or extrusion
Subgrade Sensitivity	High (requires proper compaction)	Low (more forgiving) – very good multiaxial properties
Typical Thickness Range	40 – 100 mil 1.0–2.5 mm	30 – 80 mil 0.75–2.0 mm

Application Suitability

HDPE is ideal for:

- Long-term containment of aggressive chemicals
- Landfills, hazardous waste sites, produced water and mining leach pads
- Projects requiring high tensile strength and puncture resistance
- Exposed geomembrane versus backfilled
- Properly compacted stable subgrades

LLDPE is preferred for:

- Long-term containment of moderate aggressive chemicals
- Wastewater, produced water, tailing ponds with irregular terrain or poor subgrade conditions
- Landfill caps and closures, Above ground storage tanks (AST's)
- Potential for subgrade deformation and movement
- Applications requiring factory fabrication for rapid deployment and flexibility

Conclusion

Both HDPE and LLDPE geomembranes are proven solutions for containment, but their performance characteristics diverge based on molecular structure and mechanical behavior:

- **HDPE** offers unmatched chemical resistance and rigidity.
- **LLDPE** provides superior flexibility and multiaxial properties.

Additionally, **blended geomembrane products** that combine the benefits of both HDPE and LLDPE are available and may offer optimized performance for specific applications.

Recommendation:

Select the geomembrane that best aligns with your project's fluid type, subgrade conditions, installation planning, and expected service life. For critical applications, consult with geomembrane manufacturers and geotechnical engineers to ensure optimal material selection and regulatory compliance.



Photo of HDPE liner being installed courtesy of Comanco

