



Tech Note: HDPE versus LLDPE Geomembrane Liners



Contain Enviro Services Ltd. is the leader in the supply and installation of geomembranes for a wide variety of challenging containment applications. Contain Enviro Services Ltd. feels that there is no one single geomembrane which is suitable for every containment application; therefore we have insured that we have access to the complete spectrum of geomembrane materials and can suggest the most appropriate and cost effective material for your containment project.

During the geomembrane selection process, a common question raised is: which geomembrane is most suitable for my application? Two common choices are HDPE and LLDPE. This Tech Note discusses some of the advantages and disadvantages of these two materials in an effort to better inform you and to hopefully make the geomembrane selection process less intimidating.

Both these materials have excellent chemical resistance properties and are commonly suggested and considered during the design or construction phase of a containment project. High Density Polyethylene (HDPE) and Linear Low Density Polyethylene (LLDPE) are both materials which belong to a family of materials classified as polyolefins, and therefore have very similar chemical resistance characteristics, making them common choices for both primary and secondary containment applications. While they have very similar chemical resistance properties, their individual chemical make-up gives them different mechanical properties which need to be considered during the geomembrane selection process.

There are many things to consider when making your choice, HDPE is a stiffer material giving it greater puncture resistance; however LLDPE is more flexible and may easily stretch over the obstruction. HDPE, pound for pound, is typically less expensive than LLDPE, however LLDPE liners can be manufactured in thinner grades which may offset this advantage. LLDPE is flexible enough to be prefabricated in a shop ahead of time, while HDPE must be installed and welded in the field, however if the project is quite sizable, the large roll dimensions of HDPE may offset this advantage.



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Field vs. Shop Fabrication: An important consideration which must be factored into the geomembrane selection process is the ability of LLDPE to be shop fabricated. This means the geomembrane can be prefabricated indoors, ahead of schedule, welded and tested 24/7 on a dry concrete floor under controlled conditions. Alternatively, HDPE arrives on site in large 23 foot wide rolls where it is unrolled, welded and tested in the field and if weather conditions are less than ideal, things typically slow down. When it rains, snows or gets dark, things typically stop.

HDPE is a stiffer material and when folded over upon itself, the material will be stretched beyond its yield point, damaging and weakening the material at this point. LLDPE is far more flexible and if it is folded over on itself the material will not be damaged, giving this material the ability to be shop fabricated. Meaning it's welded indoors, accordion folded and rolled up, then sent to the field and installed. If the project is quite large several large panels can be sent, then welded together in the field in a large patch-work quilt arrangement. Each panel is typically kept around 4,000lbs, so depending on the thickness of LLDPE, very large panels of 25,000ft² or greater can be prefabricated into one panel, typically resulting in far fewer hours required to install the geomembrane in the field.

The chart below compares the mechanical properties of 40 mil LLDPE to 40 mil HDPE.

Standard	ASTM	HDPE 40mil Smooth	LLDPE 40mil Smooth
Nominal Thickness	D5199	40 mil 1.0 mm	40 mil 1.0 mm
Density	D792	0.94	0.939
Tensile Strength	D638 Stress at Yield	84 psi 15 kN/m	152 psi 26.6 N/mm
Tear Resistance	D1004	28 lbs 125 N	22 lbs 98 N
Elongation	D638	18%	800%
Puncture Resistance	D4833	72 lbs 320 N	61 lbs 271 N
Black Content	D1603	2.0 - 3.0%	2.0 - 3.0%
Low Temperature Impact Resistance	D746	-69°F -56°C	-69°F -56°C

The geomembrane selection process can often be challenging. Besides the geomembrane material performance, several other factors should be considered; wind, moisture, temperature fluctuations, installation location and construction schedule or only a few that need to be factored into your geomembrane selection. Contain Enviro Services has over 15 years of geomembrane installation experience and can help guide you through the process. With access to the complete range of Geomembrane materials, Contain Enviro Services Ltd. will suggest the most cost-effective liner material while still meeting the timing, environmental and safety requirements of your project.

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