

# Carthage Mills

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Since 1958: America's *First* Geosynthetic Company

- We have been in the geosynthetic business for over Fifty Years!
- Our goal is to use our *experience* and *product knowledge* to help you win jobs

After viewing the following presentation, please give us a call at 800-543-4430 so that we may assist you on your next project.

[www.carthagemills.com](http://www.carthagemills.com)

# Geomembranes Liners

- Function to act as a barrier to contain liquids, and gases
- Growth driven by Federal & State Regulations
- Every community facing problem of controlling wastewater seepage



# Manufacturing Processes

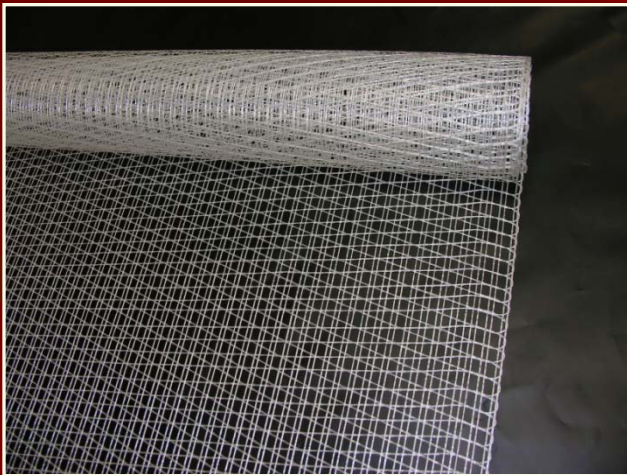
- Blown Extruded Films
  - Typically un-reinforced films
    - Examples: HDPE, LLDPE
- Calendar Process
  - Typically reinforced films
    - Examples: R-PP, XR-5



BLOWN FILM

# Other Manufacturing Methods

- Some manufacturers laminate several layers of blown Polyethylene Films over a series of reinforcing scrims



LAMINATION

# HDPE (High Density Polyethylene)

## Advantages

- High UV resistance
- Good overall chemical resistance
- Inexpensive material cost
- Good puncture at 60 mils



# HDPE (continued)

## Disadvantages

- Stiff so it susceptible to stress cracking
- Almost never pre-fabricated
- Roll goods are seamed together in the field use a wedge welder or extrusion gun
- Usually requires experienced installation company



# LLDPE Polyethylene

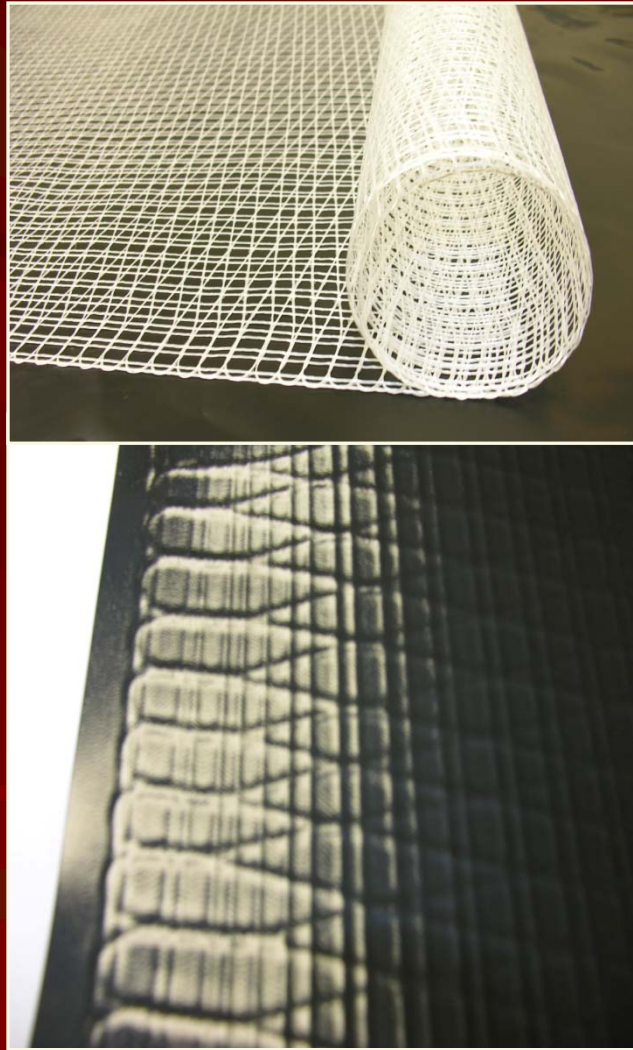


- Resistant to a Wide Range of Chemicals.
- Easily Formulated to Resist Thermal and UV Degradation for Exposed Applications.
- Flexible (no stress cracks)
- High elongation, conforms to sub-grade
- Large factory fabricated panels accordion folded and rolled for ease of installation

# Large Panels = Fast Installation



# Reinforced Polyethylene (RPE)



- Woven HDPE ribbons are laminated with LLDPE
- Excellent Exposed Longevity
- Reinforcement provides good puncture and tear resistance
- Large Flexible Accordion Folded Panels
- Field Seaming /Repair
  - Hot Wedge
  - Hot Air
  - Extrusion
  - Sewing

# Geosynthetic Clay Liners (GCL)

- Function is always containment
- GCL is self healing
- Reinforced by needle punching or stitching bentonite between two geotextiles or a geotextile and a geomembrane liner





Installing GCL by applying supplemental bentonite into the overlapped seam

# PVC (poly vinyl chloride)



Industrial Grade ~Oil Resistant~ Fish Friendly  
~Potable Water ~

# Advantages

- Good chemical & puncture resistance
- PVC is flexible so it conforms to the sub grade
- Large factory fabricated panels minimize field seams
- Field seaming
  - solvent adhesives
  - Welding equipment



# Disadvantages

- Not suitable for long term UV exposure
- (Life span exposed 2-3 years or less based upon climate and chemicals)
- Bury with 1" of top soil for UV protection



# EPDM

## (Ethylene Propylene Diene Monomer)



- High carbon black content
- Excellent Outdoor UV Resistance
- Flexible, conform to sub grade
- Pre-fabricated panels
- Seam panels in field with primer, sealant, and cover strip



# Reinforced Polypropylene-RPP

- Manufactured by calendar process
- Factory fabricated panels without stress cracks
- High resistance to UV, weather, chemical, puncture and tear
- Seams are welded with hot air, hot wedge, or extrusion gun (can be patched with heat gun)
- Disadvantage: not solvent adhesive weld able



# Seamans XR-5



- Most chemically inert geomembranes on the market
- Very high weathering, UV and chemical resistance
- Engineered to withstand extreme temperatures
- Seams are welded with hot air, hot wedge, or extrusion gun
- Fabricated into panels in the factory

# Standardized Testing Specifications

HPDE use GRI-GM13

LLDPE use GRI-GM17

PVC use PGI 1104

RPE use GRI-GM22

CGL use GRI-GCL-3

EPDM use GRI-GM21

**GRI - Geosynthetic  
Research Institute**

**PGI** PVC  
GEOMEMBRANE  
INSTITUTE



# Applications



# Evaporation Ponds



21 12 2004

30 mil PVC lines a large evaporation pond used for salt mining in Chili



Ballasting the liner with sand bags as they pull the panels into place



Testing for leaks



Pumping salt brine into the evaporation pond  
Sun evaporates the water and leaves behind the salt

# Environmental Applications

## Contaminated Area Cap



BEFORE



AFTER

# Landfill



(SAND BAG ARTISTIC CREATION..)

# Landfill Cap



# Exposed Temporary Cover

## Consider

- Durability of material to UV exposure
- Longevity (service life)
- Uplift against wind
- Anchoring system
- Aesthetics



# Temporary Cover



# Industrial Applications

- Tank Farms/ Gas Stations
- sewage sludge
- industrial sludge
- hazardous liquids
- process waste waters
- shutdown water
- potable water



# Agricultural Covers

## Hay Covers



## Silage Bunker & Grain Storage Covers



# Agriculture Liners

- Farming is big business
- Major item of “non-point source pollution”
- Concern: animal waste conveyance, recovery and treatment agricultural wastes



(Lined Pond Behind Cattle Stalls)

# Hydraulic Engineering Applications



Liners used to waterproof Canals, Dams and Reservoirs

# Aquaculture



Geomembrane Lined Shrimp Farm

- Fish-farming is also big business
- Generally shallow lined ponds
- lining required for control purposes (nutrition, oxygen, contamination)

# Construction

- Vapor Retarders
  - Under Concrete Slabs
  - Crawl Spaces
  - In Wall
- Air Infiltration Barriers
- Window & Door Flashing
- House wrap



# Pools, Ponds and Lakes

- Sites vary from in size
- Liners required for leakage control
- covers sometimes required for contamination control and for safety
- Growing market



# Golf Courses



- Major issues are aesthetics, drainage and turf maintenance
- Opportunities available in the development of new sites and in the expansion/remediation of existing sites

# Other Applications



Sports Fields



Water Features

# Carthage Mills

## Environmental Geomembrane and Liner Selection Guide

[Click Here](#)



Carthage Mills

Selection Guide

Geotextiles | Erosion Control | Geogrids | Geomembranes

### ■ Geomembrane / Liner Selection Guide

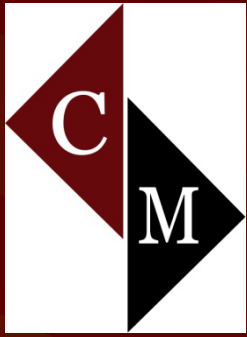
MATERIAL FEATURES	LLDPE	HDPE	PVC	DURASKRIM	SPECIALTY LINERS
Thickness	20, 30, or 40 mil	20-120 mil	20-60 mil	6-45 mil	Call for more info on: ► Absolute Barrier™ ► XRS® ► Petrogard™
Material	Linear Low Density Polyethylene	High Density Polyethylene	Polyvinyl Chloride	Tear resistant, reinforced scrim laminated between two sheets of High-Strength Polyethylene.	
Sizes	Custom Available	22' wide large rolls	Custom Available	Custom Available	Custom Available
Overview and Uses	Excellent outdoor longevity. Potable water containment.	Excellent for heavy duty liner applications	Contractor friendly available in potable, fish grade, oil resistant. Hazardous containment applications.	Solution for even the most challenging projects. Enhanced strength, excellent tear resistance & outdoor life.	Specialized for fuel/oil containment. Excellent for chemically caustic applications.
Installation and Handling	Flexible to conform to uneven surfaces.	Tough, rigid liner usually welded onsite by certified installers.	Very flexible, easy to self install using glue or solvent. Critical application may require other installation.	Available in large, manageable factory welded panels.	Varies depending on product and jobsite. Call for more information.
Performance	High elongation, tear resistance, and burst strength.	High UV protection allows it to be uncovered for extended time.	Excellent puncture, abrasion and chemical resistance; anti-slip properties.	UV and carbon black content. Exceptional dimensional stability, anti-slip properties.	Maximum performance with extreme puncture, chemical and tear resistance.
APPLICATIONS	LLDPE	HDPE	PVC	DURASKRIM	SPECIALTY LINERS
Decorative Ponds	✓				Frac Pit Liner Frac Tank Liner Oil Field Waste Pits Salt Water Pits Acid Solutions Radon Barrier Methane Barrier Waste Water Treatment Also used as a Protective Liner around geofoam to prevent exposure to petrochemicals in road stabilization applications. <b>Please call for assistance in choosing the appropriate product for your application.</b>
Oilfield Pit Liner	✓				
Golf Course Ponds	✓				
Remediation	✓	✓			
Vapor Retarder	✓				
Canal Liner	✓	✓			
Interim Landfill Cover	✓	✓			
Rain Storage Units	✓		✓		
Mine Tailing Pond	✓		✓	✓	
Pipe Penetrations			✓		
Detention Basin	✓		✓		
Soil Pile Cover	✓			✓	
Landfill Liner	✓			✓	

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Carthage Mills  
4243 Hunt Road  
Cincinnati, OH 45242  
[www.carthagemills.com](http://www.carthagemills.com)

513-794-1600 TELEPHONE  
800-543-4430 TOLL FREE  
513-794-3434 FACSIMILE  
[info@carthagemills.com](mailto:info@carthagemills.com)

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