

FGI Webinar: Protecting Water with Flexible Geomembranes

Presented by:

Brian Fraser (Vice President of Business Development,
Layfield Geosynthetics) &
Rohit Sati (Technical Product Manager, Layfield Geosynthetics)



Host:

Dr. Timothy D. Stark (Professor, University of Illinois; Technical Director, Flexible Geomembrane Institute)

Date: February 8, 2024

Introduction & Background

This webinar addressed global water scarcity and the role of flexible geomembranes in water conservation, evaporation control, and containment. Only 0.5% of the Earth's water is available as fresh water, with severe shortages projected by 2040. Flexible geomembranes—thin, impervious plastic sheets—provide engineered solutions for water storage, protection, and contamination prevention across municipal, agricultural, mining, and industrial applications.

Water Scarcity and Application Scope

97–98% of water is saline; only 0.5% of fresh water is readily available.

In the U.S., 59% of water is industrial, 33% agricultural, 8% domestic.

Applications: lining reservoirs, ponds, canals; covering potable water tanks; floating covers for evaporation control; baffle curtains in treatment facilities.

Critical for reducing seepage and evaporation (up to 97 inches/year in arid regions).

Performance Properties of Flexible Geomembranes

Reinforced materials (RPE, PVC-EIA, CSPE) include a polyester or polyethylene scrim, providing high tensile strength, tear resistance, and dimensional stability.

Non-reinforced materials (LLDPE, PVC, EPDM) behave elastomerically with superior multi-axial elongation (>100%), ideal for settlement and seismic response.

Other properties:

- Flexibility & Fatigue Resistance: Long-term movement tolerance; tested via crease and flex cycling (50,000–300,000 cycles).
 - Permeability: Ultra-low hydraulic conductivity (10^{-11} to 10^{-13} cm/sec).
 - Chemical & Environmental Resistance: Resistant to chlorine, PFAS; evaluated via accelerated immersion and NSF/ANSI 61 certification.
 - UV Resistance: Exposed life ranges 10–30+ years depending on material.
-

Material Types and Selection

LLDPE: Economical, non-reinforced, flexible; extrusion welded.

RPE: Scrim-reinforced, good tensile/tear strength; heavy grades weldable.

PVC: Non-reinforced, flexible, easy welding; best when backfilled.

PVC-EIA: Reinforced, flexible, durable; suitable for fabricated tanks and baffle curtains.

CSPE: Reinforced synthetic rubber; exceptional UV resistance (30+ years exposed), proven potable water performance.

RPP: Flexible, economical; susceptible to stress cracking in chlorinated water—use cautiously.

Manufacturing, Fabrication, and QA/QC

Factory prefabrication reduces field welding by up to 70%, ensuring seam quality.

Adherence to GRI and ASTM standards (GM17 for LLDPE, GM25 for RPE).

QA/QC includes pre-qualification of weld settings, destructive seam testing, and non-destructive methods (air lance, vacuum box).

FGI Factory Fabrication Guideline provides detailed procedures.

Project Profiles and Conclusions

L-Tolero R6 Reservoir (CA): 275-million-gallon potable water reservoir; 1.2 million sq ft of CSPE liner and floating cover.

Hinkle Reservoir (CA): 43-year-old potable water reservoir re-lined with CSPE, demonstrating longevity.

Sunnyside Valley Canal (WA): RPE lining with non-woven geotextile laminate, protected with shotcrete.

Chatfield Dam (CO): 1.8-million-sq-ft raw water reservoir using RPE.

Druid Hill Park (MD): Temporary PVC-EIA lining for a historic reservoir.

Emphasis on O&M plans and sacrificial test coupons to monitor long-term performance.

Flexible geomembranes are a proven technology for water protection, evaporation control, and contamination prevention.