Prest®

GEOSYSTEMS
GLOBAL LEADER • GLOBAL PARTNER

creating
sustainable
environments™

GEOWEB® GEOMEMBRANE PROTECTION

Protecting geomembranes is critical to their long-term performance in many applications including lagoons, detention ponds, storm water containment basins, dikes, temporary dams and landfill covers.

The Geoweb® system, with a variety of infills, will provide armor protection to impervious liners or covers so that they can maintain their integrity. Inclusion of internal tendons and ATRA® load transfer clips in the cellular structure creates a suspended protective cover over the geomembrane that prevents accidental puncturing and natural degradation.

Examples where the Geoweb® system provides protection to geomembranes are illustrated in this case study summary.

GEOWEB®
geomembrane protection

CASE STUDY SUMMARY 1

GEOWEB®

providing sustainable protection to geomembranes

case study 1

WASTEWATER CONTAINMENT FACILITY

JAMES RIVER PULP FACILITY, MARATHON, ONTARIO, CANADA • DECEMBER 1995

THE CHALLENGE

New regulations for treatment of industrial waste precipitated the need for a new treatment facility at the James River pulp processing plant. A team of engineers proposed a new large secondary treatment basin 375 m long x 278 m wide x 5 m deep (1,230 ft x 912 ft x 16.4 ft) with a perimeter of 1.4 km (4,594 ft) and 30 m (98.4 ft) long side slopes. The design specified covering the lagoon's 3.5h:1v side slopes with an 80-mil high density polyethylene geomembrane and bottom with a 300 mm (11.8 in) sand-bentonite liner over a nonwoven geotextile separator layer.

A design objective was to provide a hard protection system above the geomembrane that would 1) conform to foundation soil deformations, 2) resist down-slope sliding over the geomembrane without the use of penetrating ground anchors, 3) be nonabrasive, 4) have sufficient mass to withstand forces from wave action, 5) protect the liner from environmental damage and wildlife, and 6) maintain stability in the surface soils. The concrete-filled Geoweb® system with tendon anchorage satisfied all the design requirements.

THE INSTALLATION

To expedite construction on site, special length Geoweb sections were provided. Internal polyester tendons satisfied anchoring requirements to support the concrete-filled system on the upper portion of the lagoon side slopes. Concrete was placed in the secured Geoweb sections with a track backhoe and a concrete skiff and given a float finish.

THE RESULTS

The Geoweb system with tendon anchoring provided localized confinement of concrete cover materials and a means to anchor the protection system without damage to the geomembrane.

Project Photos courtesy of InterSol Engineering

case study 2

CONTAINMENT FACILITY • SYNCRUDE CANADA TAILINGS POND

FORT MCMURRAY, ALBERTA, CANADA • DECEMBER 1998

THE CHALLENGE

The tailings from Syncrude's crude-oil processing plant in Alberta are sent to an external sump designed to contain and process the material and act as an emergency containment facility. A large-capacity containment pond was necessary to collect the tailings. Tailings were then processed to remove the suspended solids from the water. Consultant CoSyn Technology specified a geosynthetic protection system to protect the pond's bottom and 3h:1v side slopes, prevent potential contamination to the environment, and withstand 276-kN (65,000-lb) wheel loads from heavy equipment used to clean out the sump area.

THE INSTALLATION

A 30-mm (1.2-in) hydrocarbon-resistant geomembrane was sandwiched between two layers of nonwoven geotextile: the bottom layer providing separation over the oil sand base (CBR value of ≥6) and the top minimizing potential damage to the liner. The Geoweb® system with integral high-strength tendons and ATRA® clips secured the cellular material, protecting the integrity of the underlying geomembrane. Special tendons provided the required resistance to down-slope forces from the wheel loader traffic and prevented exposure to potential degradation from hydrocarbons and the concrete's high pH. Geoweb sections, pre-assembled with tendons and ATRA® clips, were secured to a crest anchor pipe and expanded over the side slopes and sump floor. A 25 MPa (3,650 psi) concrete was pumped into the Geoweb cells.

THE RESULTS

Even while working under adverse weather conditions, construction of the Geoweb protection system was completed in two-and-a-half weeks.

Project Photos courtesy of Armtec Limited

case study 3

DAM FACE LINER PROTECTION • MUD LAKE DAM, GARDNERVILLE, NEVADA • MAY 2000
AWARDED 2000 INDUSTRIAL FABRICS ASSOCIATION INTERNATIONAL AWARD OF EXCELLENCE

THE CHALLENGE

Situated at the base of the picturesque Sierra Nevada range, Mud Lake Dam is an earthen structure used to create an off-stream storage reservoir. Since it was originally built more than 100 years ago and no longer met the safety standards of the State of Nevada, rehabilitation was deemed necessary. A cost-effective alternative to the traditional reinforced-concrete face (610 mm (24 in) required per the original design) was proposed by Colorado Lining International using an innovative geosynthetic solution that included a geomembrane with geotextile protective layers and a concrete-filled Geoweb® system cover.

THE INSTALLATION

A 16 oz. non-woven geotextile layer was first installed over the 2h:1v dam face. This layer provides protection to the geomembrane against puncture from angular aggregate particles on the earthen face. Next, a 45-mil reinforced polypropylene geomembrane was placed, custom cut to fit the varying slope length along the face. A second geotextile layer was installed to provide an additional protective layer over the geomembrane and finally a 75 mm (3 inch) depth Geoweb layer.

Assembly beds were constructed to facilitate prefabricating the Geoweb sections to specified lengths up to 34.7 m (114 ft), threading integral tendons and securing load-transfer ATRA® restraint clips. The sections were then moved to the top of the dam, the tendon ends secured to a steel-pipe deadman anchor and the trench was filled with concrete. The Geoweb sections were expanded down the dam face, secured at the toe and adjacent sections connected. Concrete was finally placed in the cellular system completing the protective layer over the dam face.

THE RESULTS

The geomembrane provides an impermeable barrier that prevents water loss through the dam face. The concrete-infilled Geoweb structure suspended over the liner offers stability and protection to the liner. This type of rehabilitation can be constructed with a relatively short schedule (at this site 6 months for design, construction and reservoir filling) compared to other rehabilitation types. In total, two layers of geotextile and one layer of geomembrane each totaling 8,360 m (90,000 ft), more than 5,575 m (60,000 ft) of Geoweb material and 420 m (550 yd) of concrete was used to protect the dam face at Mud Lake Dam.

Project Photos courtesy of Soil Stabilization Products Co.

case study 4

CONTAINMENT FACILITY • PITTSBURGH INTERNATIONAL AIRPORT, PITTSBURGH, PENNSYLVANIA • OCTOBER 1997

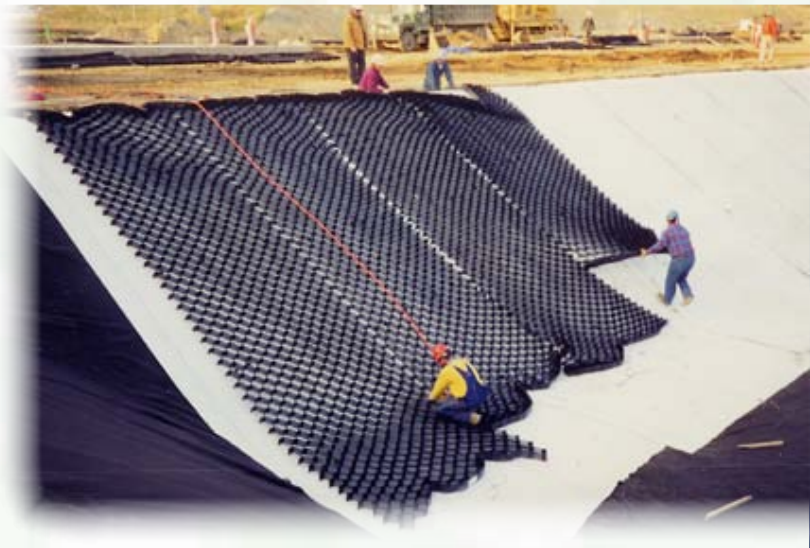
THE CHALLENGE

At the Pittsburgh International Airport – Air Force Reserve fuel facility, thousands of gallons of jet fuel are stored and pumped each year. In an effort to minimize environmental damage from contaminated storm water runoff, consulting engineers Burns & McDonnell designed a detention pond that would collect the facility's storm water and any contaminated runoff and spills.

The detention pond needed a stable protection system for the bottom and side slopes that would allow some settlement without failure and have the ability to withstand erosive forces on a long-term basis. Also, it was crucial that the protection system provide a high degree of containment. Poured concrete slabs were rejected because of the potential for cracking and their inability to withstand erosive forces after cracking. A combination of a geosynthetic clay liner (GCL) and the Geoweb® protection system was chosen.

THE INSTALLATION

The installation began with the excavation, removing debris and unstable soils, and filling depressions with on-site soils. A non-woven geotextile was installed over the complete detention pond surface, followed by 12-m (40-ft) long, 4.6-m (15-ft) wide GCL liner sections placed from a spreader-bar assembly. To facilitate the placement of tendons and load transfer ATRA® clips, the Geoweb sections were expanded in an adjacent work area using stretcher frames. Pre-assembled sections were then positioned at the crest of the side slopes. Tendon ends were secured to a 75-mm (4-in) pipe deadman anchor laid in a perimeter trench that was then backfilled. Special cuts were made to the expanded Geoweb sections for pond corners and pipe protrusions. After sections were fastened together using a pneumatic stapler, a 4,000-psi concrete was placed level with the top of the Geoweb cells and a raked finish applied.



THE RESULTS

The detention pond measures 19.8 m x 35 m (65 ft x 115 ft) with 6.4 m-long (21-ft) side slopes at an angle of 1.5h:1v. Completing the installation and immediate infilling with concrete was critical to protecting the GCL that could become damaged through moisture when exposed or unprotected. The project was reported a success by all involved parties.

Project Photos courtesy of ACF Environmental

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