



CASE STUDY

Mechanically Stabilized Earth (MSE) Wall with Reinforced Soil Pad

LOCATION: Tofino, British Columbia

PROJECT TYPE: Supply & Installation

PRODUCT USED: Titan Earth Grid™, Swamp Grid™, Pyramid Grid™ and Geocell



WHAT:

A multi-layer soil reinforcement system using Titan Earth Grid™, Swamp Grid™, Pyramid Grid™, and Geocell.

APPLICATION:

The application involved construction of a mechanically stabilized wall earth wall (MSE), varying from 2.0 meters in height along a walking/bike path beside the ocean.

CHALLENGE:

The major challenge for the construction of this MSE wall was the presence of poor sub grade, which would eventually cause the wall to sink.

The application involved construction of a mechanically stabilized wall earth wall (MSE), varying from 2.0 meters in height along a walking/bike path beside the ocean.

CONVENTIONAL SOLUTION:

The conventional design would be to construct an MSE wall, on the down slope side of the path using steel strip, polymeric straps.



Approximate location of Wayii Section of ʔapsčik ʔašii



Illustration of the uniaxial geogrid in the buttress.



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COVENTIONAL SOLUTION CONT'D:

To address this challenge the initial design recommended that the wall to be constructed in stages to allow some soil pore pressure dissipation, and strength gain in the underlying clay between stages. This would avoid the potential for adverse movements during construction and improve long-term performance of the wall, however this method would greatly increase the total construction time and inflate project costs.

TITAN SOLUTION

Titan proposed a superior solution that would not only ensure higher performance of the MSE wall, but also speed up construction and decrease project costs. This involved constructing a geogrid reinforced soil pad to increase the bearing capacity of the subgrade. This soil pad consisted of multiple layers. The base of the pad included a layer of Swamp Grid™ covered with 300mm thick of 75mm minus angular crushed rock fill. Next, Titan Earth Grid™ was placed otop with minimum 0.6m overlaps. Finally the repeat of compacted aggregate with Titan Earth Grid™ oriented perpendicular to the first layer to reduce potential for overlapping of joints between layers.

Once the soil pad was completed, the wall was constructed over top using Pyramid Grid™, and geocell. The facing of the wall was constructed with 6 layers of 200mm perforated geocell then filled in with clean angular aggregate to not only stabilize but also help with confinement and drainage. After each layer of geocell was installed, a layer of Pyramid Grid™ was placed on top. Followed by a layer of aggregate then followed by paving on the surface. Not only was the solution cost effective, but it also allowed for construction to be completed while it was raining.



Construction of layer 1, showing Pyramid Grid and Geocell



Construction with aggregate being placed over



Photo illustrating typical wall construction.



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▼ PRODUCT DESCRIPTION

Titan Earth Grid™ is effective in increasing the bearing capacity and stabilization of low load bearing soils, TE-BXPP biaxial geogrid is manufactured out of virgin polypropylene (PP) using a unique punching and drawing process. When granular material is compacted over these geogrids it partially penetrates and projects through the apertures creating an interlocking action between the particles and the grid. This positive mechanical interlock enables the grid to resist horizontal shear from the fill and thereby mobilize the maximum bearing capacity on the soft subsoil.

Swamp Grid™, is a biaxial geogrid composite consisting of Titan Earth Grid™, 200 gsm continuous fiber polyester geotextile needle punched non-woven geotextile separator by a precision heat bonding process. The biaxial geogrid is made of virgin polypropylene through a unique punching and drawing process, resulting in a bidirectional oriented monolithic and an isotropic biaxial geogrid possessing integral nodes, high tensile and flexural stiffness, high torsional rigidity and junction efficiency. Swamp Grid™ further enhances the reinforcement function while maintaining the drainage capability of the sub-base to maintain a stable structure. The non woven polyester geotextile component very effectively keeps expensive imported material from being contaminated by migration of fines from the saturated base soils. Swamp Grid™ comes in three roll widths: 3.9m, 4.2m & 5.9 meter widths.

Geocell is a more environmentally-friendly solution than other construction alternatives as it helps minimize the impact of man-made construction on the environment. ISO 9001: 2008 certified by NSF and made from 100% virgin high density polyethylene (HDPE) resin it resembles a honeycomb structure with hollow openings that can be filled with various materials for erosion control, load support and earth retention project. Perforations in the material also help improve lateral drainage. It carries a 10-Year material warranty and is proven to be an ideal economical solution for soil stabilization and reinforcement, earth retention, or slope and channel erosion protection.

Pyramid Grid™ is a uniaxial polyester (PET), geogrid manufactured with high molecular weight, high tenacity polyester yarns using a precision knitting process. This geogrid is dimensionally stable with uniform apertures that provide significant tensile reinforcement capacity in one direction. It's engineered to withstand both harsh construction conditions and aggressive soil environments and is unaffected by soil micro-organisms. A black PVC saturation coating provides further chemical, mechanical and ultraviolet protection.



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PROJECT HIGHLIGHTS

[See GeoSaskatoon 2023
Technical Paper](#)



Project:

Walking/Bike path along the ocean

Location:

British Columbia, Canada

Installation:

2020

Owner: Parks Canada

Consulting Engineer:

WSP Canada Inc.

General Contractor:

Hazelwood Construction Services

Product Solution/System: Titan Earth Grid™, Swamp Grid™, Pyramid Grid™ and Geocell

Product Supplier: Titan Environmental Containment

*Supplied the products, and offered design service and technical guidance.



Photo illustrating the "islands" of soil left adjacent to the root systems of mature trees prior to installation of the GRS geogrid



Illustrating the finished switchback trail looking down from above. (Photo courtesy of Parsons Inc.)