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CASE HISTORY

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MSE HEADWALL FOR HIGHWAY CULVERT
PORT HOPE SIMPSON, LABRADOR, CANADA

SOIL REINFORCEMENT RETAINING WALLS
Product: Terrawall®

Problem

An Armtec Bridge-Plate® culvert was to be installed to channel Blackwater Brook beneath the Trans Labrador Highway, approximately 1km from Port Hope Simpson, Labrador. The Armtec Bridge-Plate® culvert was the largest to be built in Canada at the time. The remote location required the construction, including the wing walls, to be cost effective and that used on-site material wherever possible.

Construction of culvert following river diversion

Solution

The culvert has a span of 15.85m, a height of 8.14m and is 18.0 m long. Four wing walls were required, each 14 m long with a designed height of 8.2 m. Critical considerations in the design were the high water table and water flow level.

The Maccaferri Terrawall® Mechanically Stabilized Earth (MSE) System provided the ideal solution as it forms flexible, free draining structures, ideal for the prevailing conditions. The geogrid reinforcement and front facia are made from one continuous panel of Maccaferri PVC coated steel wire double twist mesh. The mesh geogrid 'tail' is sandwiched between compacted layers of granular backfill thereby reinforcing the fill through mechanical interlock.

Unfolding and placing the Terrawall® MSE units

Terrawall® has a welded steel mesh panel immediately behind the front face of the unit. This provides rigidity to the front face and removes the need for expensive external formwork during construction. A galvanized steel 'hardware' cloth can be fitted behind the welded mesh panel if required. This cloth has very small apertures and can allow granular backfill to be used right up to the face of the structure. Therefore, larger more expensive stone is not required at the front face. Terrawall® would also be able to use the on-site granular material as structural backfill, further improving the cost-effectiveness of the system.

The front face of the wall was angled back at three degrees from vertical to allow for any future movement of the wall, due to settlement of the foundation or backfill.

Compacting structural backfill onto the Terrawall® units

Client:

NEWFOUNDLAND & LABRADOR WORKS SERVICES AND TRANSPORTATION

Main contractor:

McNAMARA CONSTRUCTION Co., St. JOHN'S, NF

Designer:

NEWFOUNDLAND & LABRADOR CONSULTING ENGS.

Product used:

TERRAWALL®

Date of building:

SEPTEMBER - OCTOBER 2002

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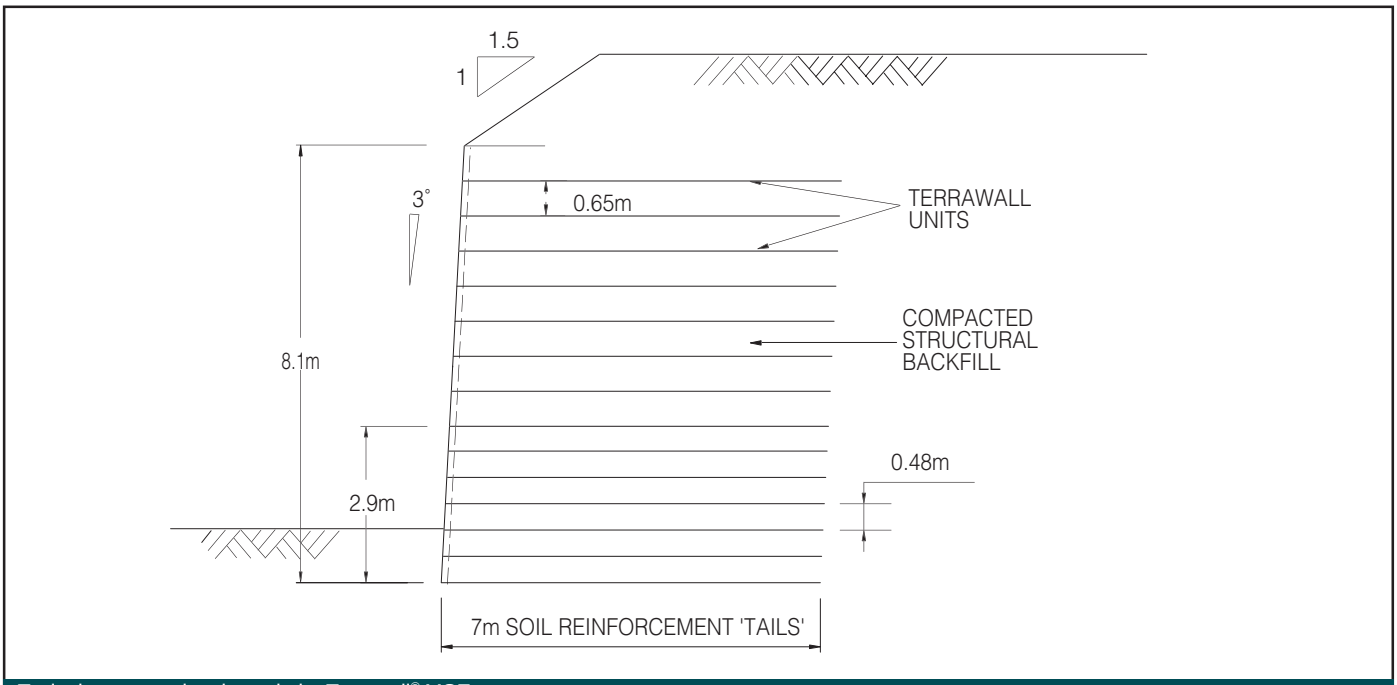

Typical cross section through the Terrawall® MSE structure

Due to the highway loads and the high water table, geogrid reinforcement lengths of 7.0 m were required. Design analyses were carried out using Maccaferri MacSTARS 2000 MSE design software.

McNamara Construction Company were engaged to construct the project. To install the culvert and bottom 3m of the Terrawall® structure, it was necessary to divert the existing channel flow and pump the work area dry.

A soft cohesive clay material known locally as “pug” like potters clay, was discovered to a depth of approximately 7.0 m, adjacent to the proposed 14m long wing walls. Removal of the clay was not possible due to the diversion channel on one side of the culvert, and on the other side the sheer quantity of clay would prove too costly. Therefore, the wing walls were shortened to 8.0 m in length and to provide erosion protection, rip rap stone was placed upon the clay slope, beyond the wing walls.

Once the structure was over 3m in height, the channel was reopened and the flow returned to its realigned channel through the new culvert.

To ensure a quality installation, McNamara Construction utilized Maccaferri’s on-site training service. Client, Newfoundland & Labrador Works Services & Transportation were very pleased wth the completed project. Terrawall® has now been used on **six major water course crossings** on the Trans-Labrador Highway; at Paradise Drive, Cartwright and three in the Red Bay area.

Placing next Terrawall® unit onto completed lower layer

The Terrawall® wing walls nearing completion

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