CASE STUDY:

SEAWALL

Ohau Point

KAIKOURA, NEW ZEALAND
MAY 2018
CLIENT: NZTA
DESIGNER, CONTRACTOR: NCTIR

Image courtesy of NCTIR

TENSAR RE500 UNIAXIAL GEOGRIDS

Tensar RE uniaxial geogrids are used for soil reinforcement in the construction of retaining walls and bridge abutment typically using Keystone TW3 modular blocks or concrete panel wall facing. Tensar RE uniaxial geogrids are also used in slip repair and construction of green slopes having either a wraparound construction or with the Green Terramesh system.

Over the past 30 years, the long term (creep) load characteristics of Tensar RE uniaxial geogrids have undergone extensive study and there is independent certification that shows their suitability for reinforced soil structures, with a design life of 120 years. Tensar RE uniaxial geogrids are highly durable and very robust and their long term strength and partial factors used to determine design strength have been rigorously tested and documented.

Available in a range of strengths, they are characterised by long, slim apertures and integral junctions, designed to interlock with fill materials, making them a key component in both the Ketsone TW3 and Terramesh systems.

GEOFABRICS®
Smarter Infrastructure

Kaikoura is a coastal town in the North Canterbury region of the South Island of New Zealand. It is a popular tourist destination known for its abundant wildlife and its year round sperm whale population. The region was badly affected by an earthquake in the November 2016.

The magnitude 7.8(Mw) earthquake caused landslides and rockfalls along the coastal road of State Highway (SH1). SH1 links the Kaikoura town north to Blenheim and south to Christchurch and at the same time serves as a major tourist route with its scenic view along the coast. A rail corridor adjacent to SH1 is used as a major transportation mode to bring goods in from Picton was also affected by the earthquake.

There was an extraordinary effort in response to this extraordinary seismic event: 21 faults had ruptured, generating the strongest ground shaking ever recorded in New Zealand. The South Island itself moved, thousands of landslides came down, land rose and slumped along the eastern coast.

Ohau Point
The largest slip in North Kaikoura. Image courtesy of NCTIR.

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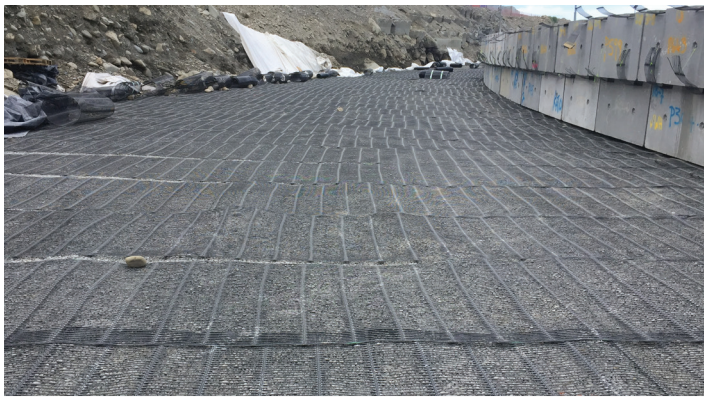
Transport infrastructure was devastated, with coastal and rural communities isolated overnight. The instant disruption to tourism, freight and primary industries was felt nationwide. Almost a million cubic metres of rock and material fell onto SH1 and the Main North Line; while the seabed rose under Kaikoura harbour. Traffic was forced onto narrow mountain roads never designed to carry the load.

Not long after the earthquake, the government established the North Canterbury Transport Infrastructure Recovery Alliance (NCTIR). NCTIR was set up to restore the network, and keep traffic moving on alternate routes. This partnership between the NZ Transport Agency and KiwiRail was new territory, as was the collaboration of Downer New Zealand, Fulton Hogan, HEB Construction and Higgins on such scale. With work sites spread over a large geographical area stretching from North Canterbury to Marlborough - some very remote - the recovery effort sought to merge the knowledge of local contractors with resources from all over New Zealand.

The worst damage in the northern part of Kaikoura was Ohau Point where about 110,000 m³ of slip material fell off the rock face. Rather than remove the material and repair the old highway, road designers chose to in some places to make use of the extra space that the seabed uplifted by the earthquake to build a new route.

Connection detail
Tensar RE580 connection detail to the seawall blocks

The right mix
Concrete which had a 4% +/- 1% cement specification and precast into the capping layer.



Ready for the next layer
The seawall was built up of alternating layers of Tensar RE and no fines concrete

Capping blocks
The capping blocks for the seawall had Tensar RE cast in

The new road required protection from the Pacific Ocean. A total of 2.5 km long and up to 10 m in height of sea wall was built to enable this. The seawall had approximately 7,500 concrete blocks each weighing 5 t with a capping layer of concrete blocks on top. The back fill was a combination of graded fill up to 100 mm diameter and no fines concrete. Tensar RE580 uniaxial geogrid was installed primarily as backfill reinforcement where there was no fines concrete which had a 4% +/- 1% cement specification and precast into the capping layer. The key reasons for choosing Tensar RE580 geogrid was the exceptional chemical resistance 120-year design life, verifiable globally recognised independent certification and the ability to connect precast tails by using bodkins.

In total the seawall used 172,705 m² of Tensar RE580 uniaxial geogrid and 12,550 bodkins which are used for joining the geogrid.