



CASE STUDY

East Taupo Arterial

Taupo NEW ZEALAND

Reinforced Earth™ Walls
TerraClass®

Owner: The New Zealand
Transport Agency

Consultants: Opus International
Consultants Limitedd

Contractor: Fulton Hogan Limited

Contractor's Designer : SKM

Construction: Nov 08 to October 10

Background:

The East Taupo Arterial provides a 16 km bypass of the central North Island township of Taupo.

First proposed in 1955, as a means of excluding heavy vehicle traffic from the township, it was not until June 2000 that an agreement was signed between the Taupo District Council and Transit New Zealand (now the NZ Transport Agency) to seriously investigate the viability of an arterial road bypassing Taupo to the East

Opus International Consultants Ltd were engaged to carry out design work and seek resource consents of the ETA in December 2004.

The ETA was tendered to three bidders as a "Design/Build" project early in 2008.

In July of that year Fulton Hogan Limited was awarded the Contract.

Challenges

The Contractor and their Designer faced a number of significant challenges.

The Northern end of The ETA had to cross an area of vigorous geothermal activity and wells providing steam to the nearby Wairakei Geothermal Power Station. The Contractor overcame

this problem by proposing a single elevated 440m long bridge to replace the four low level bridges envisaged in the Opus design.

A 100m span Network Arch Bridge was used to cross the Waikato River.

Geothermal activity, which raised soil temperatures up to 90 deg C, was encountered in several locations on the 16 km long road alignment. "Geothermal blankets", similar to "drainage blankets", were used to intercept the steam and diverted it to the side of the road alignment.

Reinforced Earth™ Structures.

The southern half of the ETA included grade separated interchanges at Centennial Drive and Broadlands Road. These provide access into the Taupo township.

Both Interchanges used Reinforced Earth™ true abutments where the Bridge Decks were supported directly on top of the Reinforced Earth™ Blocks.

Reinforced Earth Ltd provided detail design of the Structures, including the Provision of PS1 and PS2 Certificates, Construction Drawings, and Specification



Main picture and above: TerraClass® true abutment walls at the ETA over Broadlands Rd Bridge



REINFORCED EARTH
SUSTAINABLE TECHNOLOGY

Transport infrastructure



TerraClass® Reinforced Earth™ true abutment walls at the ETA over Centennial Rd Bridge.

Design was in accordance with the Transit New Zealand Bridge Manual – 2nd edition

Detailed design was carried out on behalf of Reinforced Earth Ltd by Dr John Wood of John Wood Consulting, Wellington, . and independent Verification by Michael Adler & Associates of Sydney,

Seismicity in this area is high with the both sets of abutments being designed not to exhibit any permanent displacement in a 2500 year return period seismic event. Permanent displacement of the wing walls is expected to be less than 10mm.

Seismic design coefficient for the Broadlands Road Bridge was 0.40g and that for the Centennial Drive Bridge was 0.54g. The difference, at each site, being due to the varying depth to bed rock.

The Select Fill used for the construction of the Reinforced Earth™ Structures was light weight pumice sand sourced from the site. The bulk density of this fill is between 13 and 16 kN per cum.

The effective internal angle of friction used for design is 42 deg.

The apparent friction was assessed as Tan 42deg for the full height of the wall due to uncertainty with the shear behaviour of the pumice.

The Broadlands Road abutments were constructed between July and September 2009 and the Centennial Drive Abutments between October and December 2009.

Reinforced Earth Limited provided observation of the Reinforced Earth™ Structures construction and supplied a PS4 Certificate on completion of the Construction Works.

Both sets of Bridge Abutments used the TerraClass® (cruciform) precast concrete facing panel system.

An architectural finish was achieved by the use of exposed aggregate panels incorporated in a random pattern.

Project Specifications

System	TerraClass®
Finish	Special
Structure	Reinforced Earth™ true abutments and wing walls
Area	562 sqm – Centennial Drive 542 sqm – Broadlands Rd
Max. Height	8.116m – Centennial Drive 7.105m – Broadlands Rd
Length	197.76 m in both Bridges
Design load	TNZ Bridge Manual 2 nd Edition
Design life	100 years