CASE STUDY

Gawler Belt Extension

Gawler, SA, Australia

RE Walls – Upgrading & Maintenance - TerraClass®

Owner:	Department of Road Transport, SA
Design Verification:	Reinforced Earth Pty Ltd
Contractor:	Bardavcol Pty Ltd
Construction:	2008 / 2009

AUTHORS:

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BACKGROUND

The recently completed Gawler Belt Bridge is a 31m single span structure forming part of the 25km, $40M Sturt Hwy duplication north of Adelaide, mirroring the original bridge built in 1985.

Separated carriageways along the Sturt Highway will facilitate freight movements along the key Barossa Valley to Port Adelaide route; taking advantage of the recently deepened Outer Harbour with its ability to berth Panamax sized container ships. Both the old and new bridges utilise prestressed concrete girders founded on abutment footings that bear directly onto the Reinforced Earth (RE) walls.

Of particular interest is the use of grouted soil nails to increase the strength of the existing Reinforced Earth wing walls to support the new bridge loading – a first for Australia and New Zealand.

Primary advantages included keeping the original structure safely in service without the need for traffic control on the National Highway above and avoiding the need for complex/expensive temporary supporting walls.

SOLUTION

The old RE wing wall sections had inadequate capacity to support the new abutment loads due to the lighter concentration of soil reinforcing strips into the backfill behind.

The proposal was to remove the top panels where excavation was possible, and to construct a new RE wall on top of the remaining sections. This all new RE structure would then support the new bridge loading.

The remaining RE sections were strengthened using a grid of soil nails installed through the existing facing. The soil nailed walls also provided a stable and economical temporary benched excavation, which both supported the adjacent carriageway and allowed the removal and replacement of the top RE wing wall panels.

Soil nails were specified as 25mm diameter galvanised Reid D500N bars, 8m long using 125mm diameter grouted holes. The design was undertaken by DTEI with design verification carried out by Reinforced Earth.

Soil nails were installed on respective wing walls, with upper rows of soil nails innovatively installed using the assistance of a flatbed trailer to lift the soil nailing rig.

A new cast in-situ wall disguised the interface between the existing and new RE panels and which continued the straight wall alignment. It also allowed the soil nail end plates (visible within the reinforcement cage) to be hidden from view. The founding level of the new wall was set at the same level

Main picture: Soil nails installed on wing walls
Top: A cast in-situ wall disguised the interface between the old and new RE panels and their differing plan alignments. It also tied into place the soil nail end plates.
Above: Indigenous artwork designs were placed in front of the cast in-situ walls to soften their visual impact.

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Transport infrastructure

Above: Duplicated bridge

Left: Construction of the extended RE wall progresses as per standard RE wall construction i.e. layers of backfill, REhas® soil reinforcing strips and additional panels.

as the existing RE structure to match foundation stiffness.

Temporary excavations were made safe by benching and geotextile installed to control erosion. The geotextile was removed prior to backfilling, to avoid creating a slip plane between existing and new backfill.

The construction of the extended RE wall then proceeded as normal using a similar backfill that was used in the original structure.

Cranes positioned on the newly constructed RE structure picked up and placed girders for the new bridge deck from trucks located on the existing bridge.

Indigenous artwork designs were placed in front of the cast in-situ walls to soften their visual impact. The panels were laser cut from 5mm stainless sheet and offset horizontally from the cast in-situ walls for aesthetics.

OUTCOMES

The project is considered a success and subsequent monitoring since girder placement in August 2008 has not revealed any movements.

ADVANTAGES

- No works or speed restrictions on the National Highway route were required.
- Avoids the difficult and expensive task of providing 8m high temporary retaining walls within an existing Reinforced Earth (RE) structure.
- Greatly simplifies the extension of an RE structure supporting a skewed bridge abutment.
- The substantial cost of temporary works is channelled into the final structure (i.e. temporary and sacrificial retaining walls versus permanent working soil nail walls).

COMPLEXITIES

Design verification of the new construction method when combining soil nails and reinforcing strips.

CONSIDERATIONS

- Ignore contribution of old reinforcing strips in analysis. Conservatively design the soil nailed zone solely on the strength of the nails due to their much higher relative stiffness and the likelihood soil nails will attract more load.
- Pay attention to the existing backfill within the RE zone. The weakly cemented fill on this project assisted with the provision of safe benched temporary retaining walls and maintaining open soil nail holes prior to grouting.
- Implement a monitoring program to keep track of any unexpected movements of either the RE wall or bridge abutments.

Project specifications

System	TerraClass®
Finish	Vertical Rib
Structure	Retaining Wall
Area	281m²
Max. Height	5.98m
Length	62.2 m
Design load	AS5100 Bridge Loads
Design life	100 years

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