MACCAFERRI

CASE HISTORY

Ref: UK / CH / RWSR - Rev:02, Dec19

READING VIADUCT - ELEVATED RAILWAY

READING, BERKSHIRE

VERTICAL WALLS WITH CONCRETE FACING PANELS & BASAL REINFORCEMENT

Product: Maccaferri Paralink, MacRes and Paraweb

Maccaferri believes that Reading Viaduct is the first reinforced soil, discrete concrete panel faced wall constructed in the UK, supporting live railway tracks.

The longest concrete viaduct in the UK carried its first train on 4th January 2015.
Costing £45 million, this 2,000m long structure, west of Reading train station was designed to ease the bottleneck which had troubled the railway system for years.
The viaduct means that passenger train services no longer have to queue outside the station waiting for slower freight trains to pass through.
Installation of the viaduct required long approach ramps to be constructed to raise the line approximately 6.0m at both ends. Working to within 15m of the existing operational rail line meant that conventional earthwork ramps were not feasible so Maccaferri was brought in, by main contractor Balfour Beatty, to design and construct reinforced soil retaining wall solutions, compliant with the tender design proposed by Network Rail Consulting Engineers, Atkins.
In order to fit tight space constraints, Atkins had conceived the solution, in their tender design, of vertical, reinforced soil walls (RSW) with discrete concrete panels to one side of the ramps with a 1:2 slope on the other.
To provide a suitable foundation for the train loaded ramp/ RSW structures, ground improvement was necessary, owing to the variable nature of the existing soils.
Atkins proposed vibro concrete columns (VCC), with a geogrid reinforced Load Transfer Platform (LTP) to transfer the embankment loads and ensuring settlement would be kept within the acceptable limits for live rail traffic.
Balfour Beatty Ground Engineering designed and installed the VCC arrangement, consisting of approximately No. 2,300, 450mm diameter, 7.2m length columns, to the three ramp walls totalling 705m in length.
Coffey Geotechnics Ltd, designed the LTPs, using ParaLink ultra-high strength geosynthetic geogrid. These geogrids are utilised in the LTP design to absorb, spread and dissipate applied loads vertically downwards into the piled ground, increasing the capacity of the soil to span or arch over the inter-pile space.
Coffey also designed the ramp soil reinforced walls, under the direction of Maccaferri, using the MacRes, discrete concrete

Load Transfer Platform with Paralink - March 2014

Compacted fill placed over Paralink LTP - April 2014

MacRes panels and Paraweb - East ramp during construction

Main Client:

Network Rail

Client's Engineering Consultant:

Atkins

Main contractor:

Balfour Beatty

Installer:

Maccaferri Construction

Specialist Engineering Consultant:

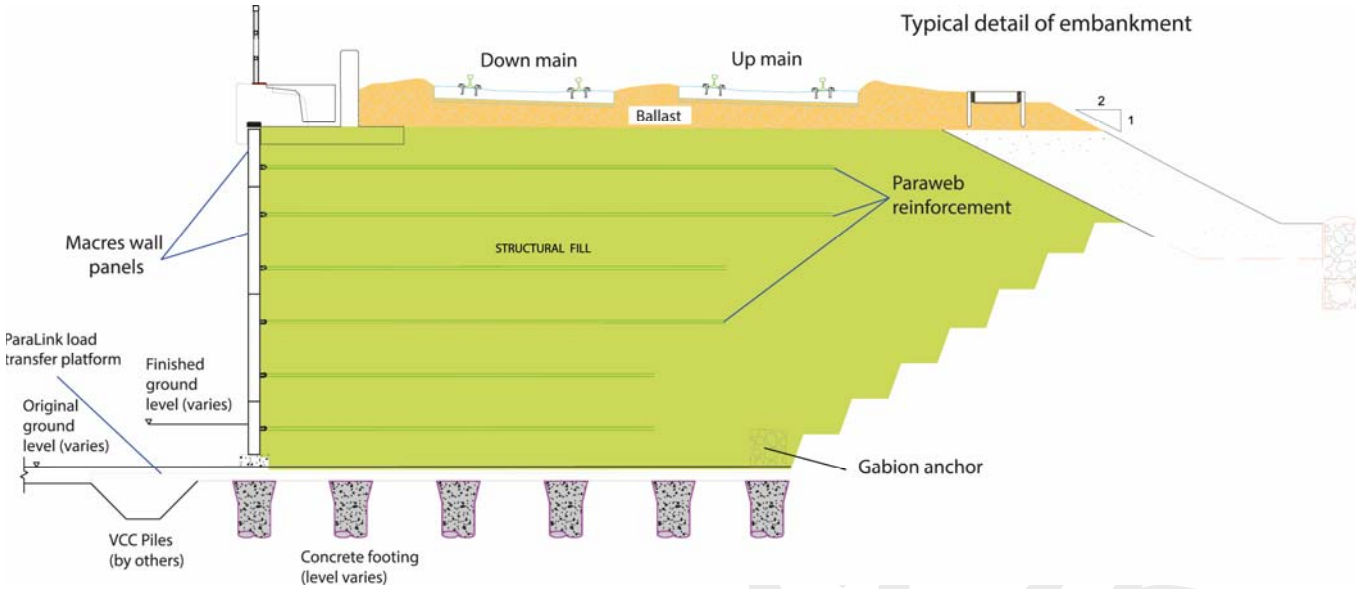
Coffey Geotechnics

Products used:

Paralink (17,000sqm) - MacRes (2,600sqm)

Date of construction:

March 2014 - January 2015



West ramp: typical embankment section

panel faced, reinforced soil system. MacRes utilises ParaWeb, polymer geo-composite strapping, for the wall reinforcement.

This system using Paraweb was first used in the UK in the late 1970's.

Heavy section de-railment barriers were cast in-situ on top of the MacRes walls and additional lengths of extra strength Paraweb were incorporated, where required, to accommodate possible derailment loadings.

There are clear engineering benefits in the use of polymer reinforcement over traditional steel strapping. Rather than increasing or reducing the strap spacing to change the reinforcement strength as would be required with steel, different strengths of polymer strapping can be incorporated to change the capacity. At the Reading site, the strapping strengths vary from 27kN to 100kN.

An additional advantage of Paraweb is that it is less vulnerable to adverse soil conditions than steel or other types of reinforcement. This has enabled recycled material (such as PFA or crushed concrete) to be used as the structural fill, in the reinforced soil block, on some projects.

The West ramp incorporates 800sqm of MacRes panels, and the East, 1,350sqm.
A third ramp (called Festival ramp) serving a southbound spur line was also constructed using the same ParaLink LTP/ MacRes reinforced soil wall system. Here, approximately 450sqm system were installed.
Both the East and West ramps are MacRes faced on one side only, with the exception of the Festival ramp which has facing to both sides of a 10m length adjacent to the viaduct.

West ramp complete - November 2014

Festival ramp under construction - November 2014

Reference

Rail Engineer Magazine, December 2014

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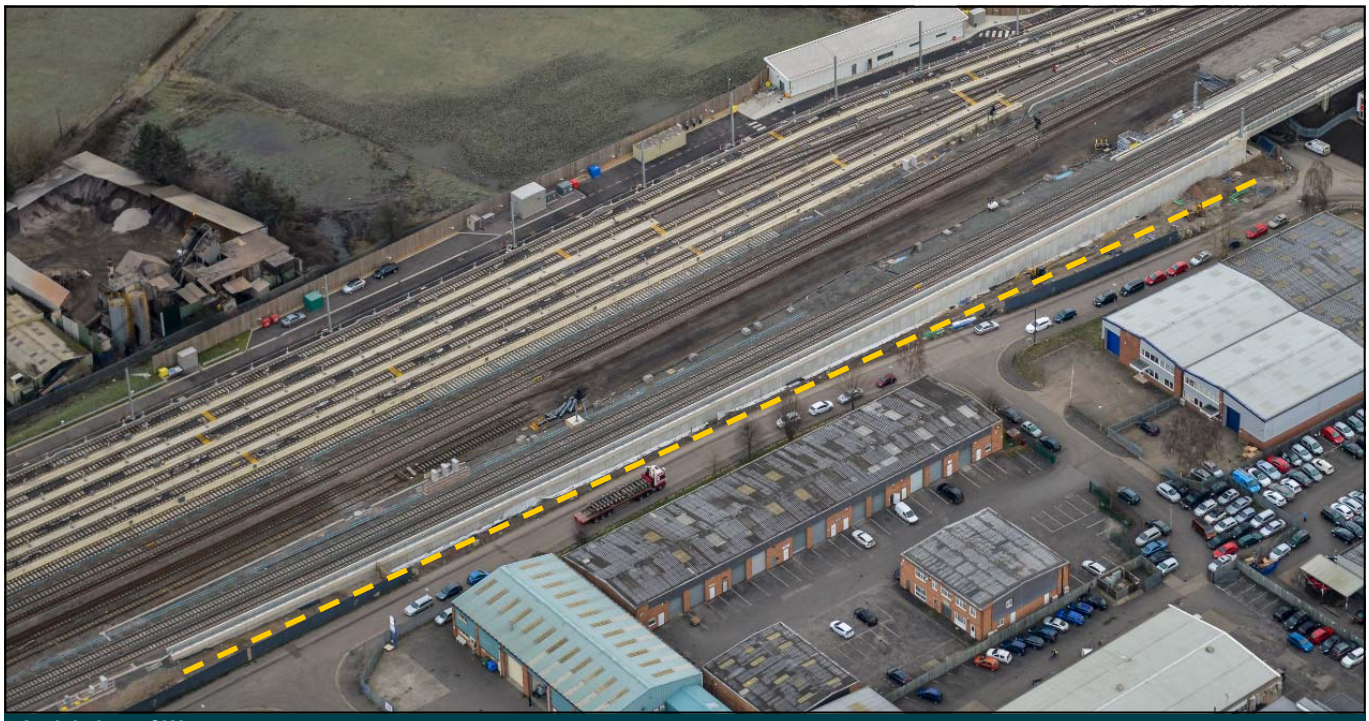

Aerial view of West ramp

Aerial view of East ramp

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