REINFORCED EARTH WALLS

Reducing settlement risks at Avonmouth Severnside

Key stats:
Length of wall: 76m
Number of panels installed: 129
Duration of installation: 6 weeks
Capital savings: £10,000-£15,000
Carbon saving: 70t CO_2eq

Challenge: A significant wall was required on a confined site with soft ground.

Solution: Using a reinforced earth structure to accommodate settlement and ease construction.

Further information:
Avonmouth and Severnside Enterprise Area Ecology Mitigation and Flood Defence Project

Contact: gareth.mason@mottmac.com

Ross Barton, Project Executive, Environment Agency:"This part of the scheme had several constraints linked to poor ground conditions and access restrictions. BMMJV's innovative solution overcame these challenges and had the added benefit of providing the project with carbon and capital efficiencies."

THE AVONMOUTH AND SEVERNSIDE ENTERPRISE AREA (ASEA) ECOLOGY MITIGATION AND FLOOD DEFENCE PROJECT IS THE BIGGEST SCHEME OF ITS KIND IN THE WEST OF ENGLAND'S HISTORY.

The £80 million project stretches 17km along the coast of the Severn Estuary and is a partnership between South Gloucestershire Council, Bristol City Council and the Environment Agency. It is being constructed by a Bam Nuttall Mott MacDonald joint venture (BMMJV).

The new and improved flood defences from Lamplighter's Marsh in the south to Aust in the north will help protect around 2,500 homes and businesses from climate change related flooding and rising sea levels when they are completed in 2026/27.

The flood defence work will include 5,411m of raised earth embankments, which will make up around half of the total flood defences; 3,055m of sheet piled walls; 1,450m of in-situ reinforced concrete walls, and 1,925m of precast reinforced concrete walls. Near Severn Beach, in-situ reinforced concrete walls with glass panels are being installed to give views across the estuary.

Background

A privately owned building sat close to the alignment of the flood defence. There was not enough space to build an earth embankment so a wall was needed to preserve the building while achieving the required level of flood protection. The outline design indicated that an L-shaped reinforced concrete (RC) retaining wall would be suitable there. However, following detailed ground investigations, it was established that excessive settlement of the underlying ground would mean that significant ground improvement would be needed, delaying the programme and having additional impacts on the landowner. Access restrictions to the working area also made constructing a large RC wall difficult.

What did you do differently?

BMMJV decided to change from an RC wall to a reinforced earth wall (supplied by RECO) as it can accommodate the levels of settlement we expected due to its flexible nature. Reinforced soil uses anchor straps embedded within the soil mass to provide stability; resistance to pull-out is provided by passive action of the anchor and friction along the anchor straps.

Benefits

- ***We did not need any ground improvement, which reduced costs for the client partnership.***
- ***The reinforced earth wall has the same design life and standard of protection as a more standard RC wall.***
- ***We needed smaller plant.***
- ***Costs would be lower compared to RC wall due to the need for piling.***
- ***Carbon savings due to reduced quantities of concrete.***
- ***We could adopt a variety of finishes from a planted green wall to modular concrete panels: the latter was adopted for ASEA as it mirrored the finish approved at planning.***

The construction method was also well suited to the limited working area available and avoided the difficult logistics of getting concrete to this remote location. This involved:

1. Construction of foundations for the concrete facing
2. Compact a layer of soil, lay a reinforcing strap which is connected to the concrete facing panel
3. Then a further layer of soil is laid and (2) is repeated until the necessary height is achieved.

Lessons Learnt and future uses

The reinforced earth wall is a low cost and straightforward design solution in places where underlying ground conditions are poor, which is common in the locations of flood defences. It is also well suited for locations with limited space/access. Potential disadvantages are that the design and construction will require the involvement of a specialist contractor and the straps will complicate any future excavations/ modifications to the flood defence.

Environment Agency

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