



CASE STUDY

CHAFFEY DAM UPGRADE

Tamworth, NSW, Australia

Reinforced Earth® Retaining Walls
TerraPlus®, Wirewall & Structural
Precast Products

Owner: WaterNSW

Consultants: URS Australia Pty Ltd

Contractors: John Holland Pty Ltd

Construction: 2015 - 2016

Background

Chaffey Dam is located 43km south-east of Tamworth on the Peel River, NSW. The dam provides water for irrigated agriculture, industry, town water supplies, river flows and domestic requirements, flood mitigation and environmental flows. Prior to the upgrade the dam could be described as a 54m high, 430m long clay cored rockfill embankment with a combined morning glory spillway and outlet works.

The objectives of the Chaffey Dam Safety Upgrade and Augmentation Project was to augment the dam's storage capacity from 62GL to 100GL and upgrade the dam to comply with ANCOLD and NSW Dam Safety Committee (DSC) safety standards regarding flood mitigation and stability of the structure.

Stage 1 of the project was the construction of a 35m auxiliary spillway with release plug which was completed in 2011.

Stage 2 and augmentation involved raising the dam wall by 8m and raising the morning glory spillway bell mouth crest by 6.5m.

John Holland Pty Ltd (JH) was appointed as the Principal Contractor of Stage 2 by WaterNSW, URS Australia Pty Ltd (now AECOM) designed the dam raising, The Reinforced Earth Company (RECO) was subcontracted by JH to design and supply the Reinforced Earth® structures and Fusion Civil Pty Ltd installed the walls.

Challenges

The scope of works for the upgrade included: firstly, the installation of a vertical Reinforced Earth® wall structure with an attached 1.8m parapet wall on the crest of the existing earth and rockfill embankment to raise the dam wall by 8m; and secondly to raise the water level by 6.5m by duplicating the existing bell mouth crest of the morning glory spillway structure at a higher level.

RECO was contracted to design and supply 6950m² of Reinforced Earth® back to back walls. In addition, on the top of the upstream wall is a 1.8m high parapet wall and at the base is an L-shaped wall with a handrail. This L-shaped walkway creates walkway access along the upstream of the wall.

RECO also designed and supplied a temporary Reinforced Earth® wire wall which created a craneage platform from which the morning glory spillway bell mouth crest was raised.

The design engineers were required to assess stresses and deformations under flood surcharge loading conditions, evaluate earthquake response of embankment and vertical crest raise and evaluate stresses at the base of vertical crest raise for assessment of the bearing capacity for load cases (static, flood, earthquake loading cases).



Main: View of the completed Reinforced Earth® upstream wall.

Above first picture: The precast concrete products delivered and stored on site.

Second picture: The placing of the first panels of the back to back walls.

Third picture: The compacted backfill during construction.

Hydraulic Structures



REINFORCED EARTH
SUSTAINABLE TECHNOLOGY



Above Left: View of the Reinforced Earth® downstream wall

Above Right: View of Reinforced Earth® temporary wire wall

Solutions

The Reinforced Earth® technique is perfect for forming a double-faced structure to raise the height of an existing earth dam and thus to increase the spillway capacity and eventually the holding capacity of the reservoir it impounds. The uniform distribution of the loads throughout the Reinforced Earth® mass and the ability to increase the stability of existing embankments make the method well suited for construction on top of earthfill dams. The precast concrete panels combined with proper backfill materials ensure adequate drainage, especially if the structure may be subjected to sudden rapid draw down and other variations in water level. To ensure adequate drainage the select backfill chosen was placed in multiple select fill zones ranging from silty, to sandy, to granular. The finer backfill was placed on the upstream side so if any water ingress occurred it would be accommodated by the granular fill on the downstream side.

At RECO's precasting facility in Tuggerah, approximately 1910 TerraPlus® precast concrete facing panels were cast to construct the upstream and downstream walls, 124 L-units manufactured in Peri formwork for the walkway, 31 parapet units to match existing units from the original dam for the upstream wall. The manufacturing and storage of the precast structural products and precast concrete facing panels for this large project was a logistical challenge. All materials were transported and stored on site in readiness for the rapid construction inherent to these structures.

Conclusion

The benefits from this project will be to secure a long term water supply for Tamworth, improve the security of water entitlements for downstream users, and improve the ability of the dam to withstand extreme flooding.

Right: View of the Reinforced Earth® wall during construction from the morning glory spillway

Project specifications

Systems Reinforced Earth® with TerraPlus® concrete facing panels, parapet & L shaped structural precast products

Finish Concrete Smooth Grey

Structure Back to Back Reinforced Earth® walls

Area 6950 m²

Max. Height 7.3 m

Length 1002 Lm

Design load 20kPa

Design life 100 years

System Reinforced Earth® Wire wall

Structure Temporary wire wall

Area 110 m²

Max. Height 6 m

Length 20 Lm

Design load 20kPa–100kPa (crane pads)

