

Case Study

Megget Reservoir

Shell Bitumen - uses bitumenous grouting to repair and protect the reservoir supplying Scotland's capital city with water



The Megget reservoir, in the Borders region of Scotland, holds 64,000 mega litres of water to supply the city of Edinburgh and its 450,000 residents. It supplies 100 million litres of water daily. In the first project of its kind in the world, bitumenous grouting was used to repair and reinforce protection for a reservoir embankment.

The 56m high by 570m long dam is a gravel filled embankment with a central asphaltic core. The reservoir is retained by the largest earth dam in Scotland. The upstream face of the dam is protected against wave action erosion by graded quarry rock, known as 'rip-rap', on a granular filter.

First project of its kind in the world - bitumenous grouting used to repair Scotland biggest earth dam reservoir

Critical Success Factors:	<ul style="list-style-type: none">- Allowed reservoir to continue operating- Maintained fish stock- Minimal maintenance required- Low installation costs
Application:	- Bitumenous grout
Volume:	1,100 tonnes of 100 pen bitumen supplied
Product family:	Bitumen
Product grade:	Shell Cariphalte TS
Client:	East of Scotland Water
Contractor:	Hesselberg Hydro
Project Engineer:	Whatlings (Civil Engineering) Ltd



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This has suffered continuous erosion since 1983 when the reservoir was filled and a wind-wave investigation showed that waves were greater than designers had anticipated. Repairs had to be carried out on an ongoing basis, resulting in high maintenance costs and considerable disruption.

Bituminous grouting offers the best long term solution

East Scotland Water undertook a study to evaluate methods for upgrading the existing rip-rap protection layer to ensure minimal maintenance and long term service. Options assessed included the installation of an additional layer using bigger rock elements, a shallower upstream slope angle, concrete block work or bituminous grouting.

The Megget reservoir supplies 100 million litres of water daily and is the first project of its kind in the world. Bituminous grouting was used to repair and reinforce protection for a reservoir embankment.

The contractors, Hesselberg Hydro, undertook on-site trials and visited asphaltic coastal defence structures in Holland which suffered a similar wave attack. As a result of extensive research, they selected bituminous grouting.

Bituminous grout is an homogeneous mixture of mastic, consisting of penetration grade bitumen, limestone filler and natural medium to fine sand, together with small graded crushed stone or gravel.

A tailored solution

The Shell Bitumen team came on board and were able to quickly add value to the project, working in close collaboration with the main contractors, Hessel Hydro, advising on the best application method and product mix.

A pattern grouting technique was selected to provide maximum strength, while also limiting the amount of grout, and maintaining adequate porosity of the rock layer to dissipate the hydraulic energy of breaking waves and water pressure. It also provided the most economical long-term solution.

The viscosity of the mixture was critical to ensure the grouting penetrated the full depth of the rip-rap layer, but also gave sufficient stability to the existing rock after cooling, without sagging at ambient temperatures on the steep slope of the embankment.

- The most economic and practical solution
- Full scale site trials prior to the award of the main contract demonstrated the increased strength of the rock layer while retaining adequate porosity
- 27,000m² upgraded with pattern grouting on a 2.5m grid
- On site production of 10,500 tonnes of mastic
- Full using made of mobile quality control laboratory
- Mastic grout applied hot from specially designed skips, penetration relying on gravity.
- Completion was on time in and within budget.

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