

Butterley Reservoir Spillway

Marsden, West Yorkshire, UK

Butterley Spillway provides an overflow to divert surplus water from the Butterley Reservoir and prevent flooding to the surrounding towns and villages. Since its construction in 1906, the Victorian Spillway had severely deteriorated over time and was in need of urgent renovation and remedial repair works.



Project owner
YORKSHIRE WATER

Product
**DURUS S400 45mm
Macro Synthetic Fibre**

**CRACKSTOP M ULTRA
Micro Synthetic Fibre**

Function
Concrete Reinforcement

Contractor
J N Bentley

Volume
**4,000m³ of Fibre
Reinforced Concrete**

Challenge

The spillway was originally designed by Thomas Hawksley in 1906 and was Grade II listed. A recent inspection by an independent Consultant Engineer identified the need to repair and improve the spillway to ensure it complied with legislation, in particular, the Reservoirs Act 1975.

The Organisation responsible for the Butterley Reservoir and Spillway, Yorkshire Water, commissioned Contractors J N Bentley to conduct remedial works and replace parts of the collapsed Stone Masonary, with reinforced concrete, cast in-situ.

As part of the works, it was also agreed to raise the spillway walls and replace a steep stepped section with a flat slope to maximise service life and ensure flood waters were contained within the channel during use.

Solution

The Appointed Contractors, J N Bentley, consulted with the Client and agreed that the best course of action was to replace the majority of the unserviceable original stone channel with Reinforced Concrete. Conventional Steel Mesh is highly susceptible to corrosion caused by contact with the alkaline water found in the Reservoir, so a Synthetic Macro Fibre Solution was the most effective alternative.



The Victorian Reservoir Overflow is handcrafted Stone Masonry and forms the Channel which is Grade II Listed.



Some of the original Stone Masonry is reused with the remaining concrete channels installed with a Fibre Mix.

Adfil engineers consulted with J N Bentley and the Ready Mix Concrete Supplier, Huddersfield Ready Mix, to provide a Fibre Reinforced Solution.

- To replace the original steel mesh specification, they proposed Macro Synthetic Fibre Durus S400 at a dosage of 4kg/m³.

As the fibres are produced from a polypropylene, there is no risk of corrosion caused by contact with the alkaline reservoir water.

- The concrete mix also contained Micro Synthetic Fibre, Crackstop M Ultra, at a dosage of 0.91kg/m³. The addition of Crackstop M Ultra enhanced the durability of the Concrete, subsequently maximising service life.

Benefits of the Solution

Macro synthetic fibres do not rust or corrode. This eliminates the risk of a reduced working life of the reinforced concrete.

There is no requirement for cutting, fixing and placing of steel mesh. As a consequence build time and overall construction cost are reduced.

Installation benefits

- The Fibre Reinforcement is premixed in to the concrete during batching which eliminates the need for steel mesh to be handled & stored on site.
- There is no need to allow for steel cutting and fixing in the construction schedule.
- There is no risk of steel mesh being placed incorrectly, with insufficient concrete cover, as the fibre reinforcement is distributed throughout 100% of the concrete volume.
- Health & Safety Hazards associated with steel handling, cutting & fixing were eliminated.
- There is an embedded CO₂ saving of around 56% when compared to the use of traditional welded steel fabric reinforcement.

Result

Initial concerns from the Local Community about preserving the natural look of the Historical Spillway were overcome as the Contractor used a combination of original handcrafted stones and the Durus macro synthetic fibre reinforced concrete. The local public and Client, Yorkshire Water, were very happy with the completed renovation, which will be part of the natural landscape for many years to come.

Products used:



Macro Synthetic Fibre - DURUS S400 45mm



Micro Synthetic Fibre - CRACKSTOP M Ultra