

The Falkirk Wheel Boatlift

British Waterways 'Millennium Link' canal project is the largest UK canal restoration ever. It reconnects the Forth & Clyde and Union Canals allowing unhindered passage of traffic between Glasgow and Edinburgh.

The centrepiece to this project is the Falkirk Wheel - the world's first rotating boatlift. The 35m high, 1500 tonne machine transports canal barges and other boats between the Forth & Clyde and the Union Canal, a vertical drop of 18 metres. Before the closure of the canals in the mid 20th century this transfer was achieved by a flight of eleven locks.

Bachy/Soletanche and Morrison Construction Joint Venture won the contract to design and construct a new section of canal, a tunnel beneath the Antonine wall, a section of aqueduct, the wheel and receiving basin. In turn the Joint Venture appointed Butterley Engineering to design and construct the wheel. Butterley undertook all construction work for the wheel and set up its own team to carry out the design work. This team comprised Tony Gee and Partners, to undertake the structural design responsibilities and M G Bennett & Associates to design the mechanical and electrical equipment for the wheel.

The exemplar design was perceived as unsuitable by British Waterways, therefore a series of design workshops took place under the direction of the architect RMJM to improve on the aesthetics of the design. The aim of these workshops was to produce a more dramatic profile for the wheel, a design for the 21st century.

All parties worked closely together at the concept stage to produce a futuristic scheme using innovative engineering solutions. A concept wheel with four gondolas using an interlocking gear system was proposed by Bennetts together with an ingenious lock gate system. RMJM changed the concept design from a four single vessel gondola to two two-vessel gondolas, producing the picture of the Falkirk as we know it today.

The next stage involved Butterley, Bennett Associates and Tony Gee liaising with two sets of architects to produce drawings of how the wheel would work. The lock gate and interlinking gear system proposed in the concept design was adopted by RMJM. This means the gondolas are now linked by gears to the central axle so that there is a positive drive between axle and gondola, thus avoiding the possible pendulum action of the gondolas during high wind, which may have been the case had the original exemplar design been used.

Following this Bennett Associates produced the general arrangement drawings of the wheel to enable the other parties to proceed with the detailed design. Bennetts were also responsible for the detailed design of the operating and rotating mechanism of the complex wheel structure and the mechanical interfaces.

The assembly provides the final link to the £78 million Millennium Link Project and an international landmark. Bennett Associates have won numerous awards for their contribution to the Falkirk Wheel.

Tenth Anniversary Update

As the tenth anniversary of its opening approaches, the team at Atkins Rotherham have been asked to revisit the Falkirk Wheel to ensure it continues to run smoothly. After an inspection was carried out during the shutdown period in the winter of 2010, the inevitable wear and tear of nearly a decade in use whilst open to the Scottish elements was evident. As a result, an improved design for the rail anchor system is currently being investigated along with a more systematic maintenance processes. Looking further ahead we are also developing plans and procedures to replace the rails entirely once they eventually reach the end of their life.

Bennett Associates (originally founded in 1984) was acquired in 2008 by Atkins; bringing their proven technical expertise to the UK's leading engineering consultancy.



- First structure of its kind in the world
- Design life of at least 120 years
- 35 metres high
- 35 metres wide
- 30 metres long
- Each gondola contains at least 250,000 litres of water
- Capable of carrying 8 boats at a time
- A single trip will take 15 minutes



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